APPENDIX A

LARGE ATTACHMENTS TO COMMENT LETTERS

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Four letters included large attachments that did not include specific comments on the Draft PEIR. Those attachments are included for the following comment letters:

- Salton Sea Authority;
- Citizens United for Resources and the Environment, Inc. and Consejo de Desarrollo Economico de Mexicali;
- Solar Bee, Inc.; and
- Hartmut Walter.

Large Attachments to Salton Sea Authority Comment Letter

ATTACHMENT 1

Large Attachments to Salton Sea Authority Comment Letter

OUR CHANGING CLIMATE

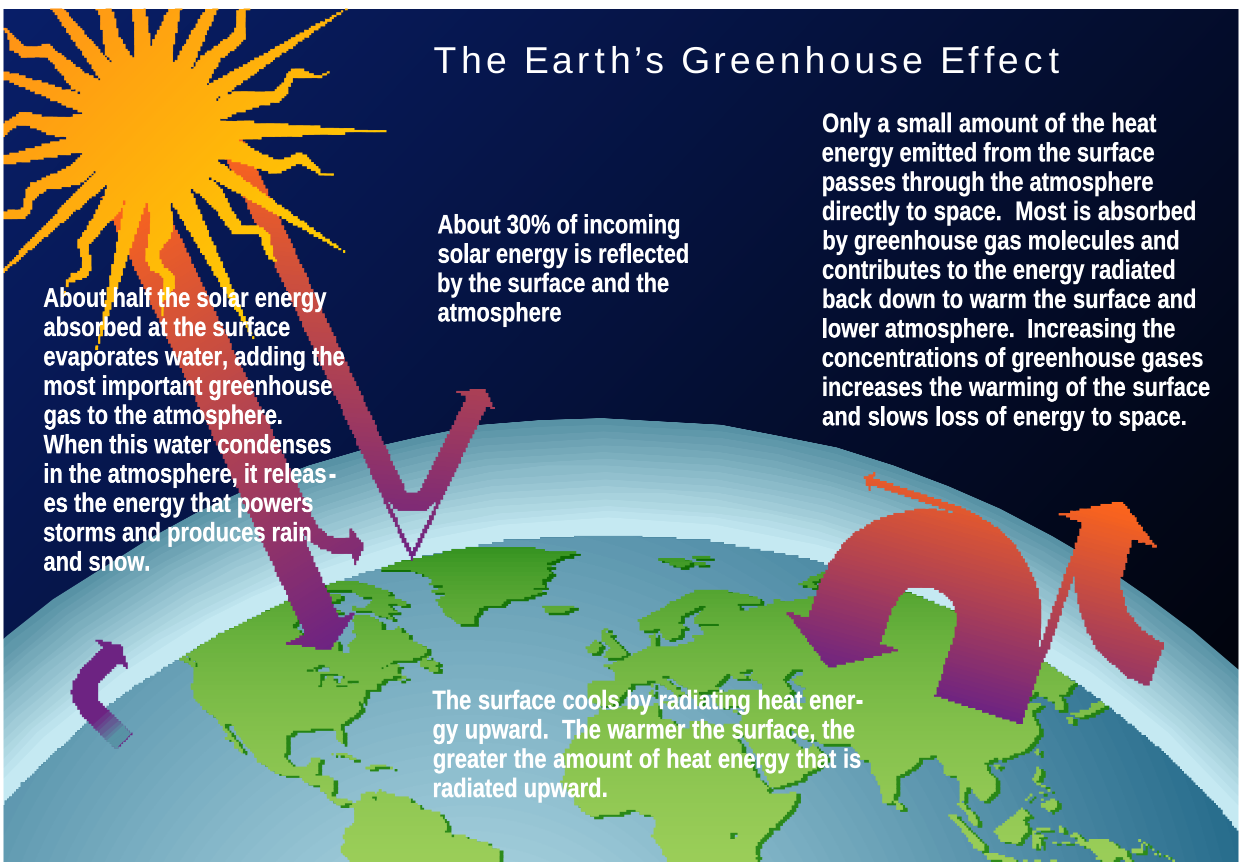
Global projections based on population growth and assumptions about energy use indicate that the CO_2 concentration will continue to rise, likely reaching somewhere between two and three times its pre-industrial level by 2100.

Climate and the Greenhouse Effect

Earth's climate is determined by complex interactions between the sun,oceans,atmosphere,land,and living things. The composition of the atmosphere is particularly important because certain gases (including water vapor, carbon dioxide,methane,halocarbons,ozone,and nitrous oxide) absorb heat radiated from the Earth's surface. As the atmosphere warms,it in turn radiates heat back to the surface,to create what is commonly called the "greenhouse effect." Changes in the composition of the atmosphere alter the intensity of the greenhouse effect. Such changes,which have occurred many times in the planet's history, have helped determine past climates and will affect the future climate as well.

Human Activities Alter the Balance

Humans are exerting a major and growing influence on some of the key factors that govern climate by changing the composition of the atmosphere and by modifying the land surface. The human impact on these factors is clear. The concentration of carbon dioxide (CO_2) has risen about 30% since the late 1800s. The concentration of CO_2 is now higher than it has been in at least the last 400,000 years. This increase has resulted from the burning of coal,oil,and natural gas,and the destruction of forests around the world to provide space for agriculture and other human activities. Rising concentrations of CO_2 and other greenhouse gases are intensifying Earth's natural greenhouse effect. Global projections of population growth and assumptions about energy use indicate that the CO_2 concentration will continue to rise,likely reaching between two and three times its late-19th-century level by 2100. This dramatic doubling or tripling will occur in the space of about 200 years,a brief moment in geological history.



The Climate Is Changing

As we add more CO_2 and other heat-trapping gases to the atmosphere,the world is becoming warmer (which changes other aspects of climate as well). Historical records of temperature and precipitation have been extensively analyzed in many scientific studies. These studies demonstrate that the global average surface temperature has increased by over 1ºF (0.6ºC) during the 20th century. About half this rise has occurred since the late 1970s. Seventeen of the eighteen warmest years in the 20th century occurred since 1980. In 1998,the global temperature set a new record by a wide margin, exceeding that of the previous record year, 1997, by about 0.3ºF (0.2ºC). Higher latitudes have warmed more than equatorial regions,and nighttime temperatures have risen more than daytime temperatures.

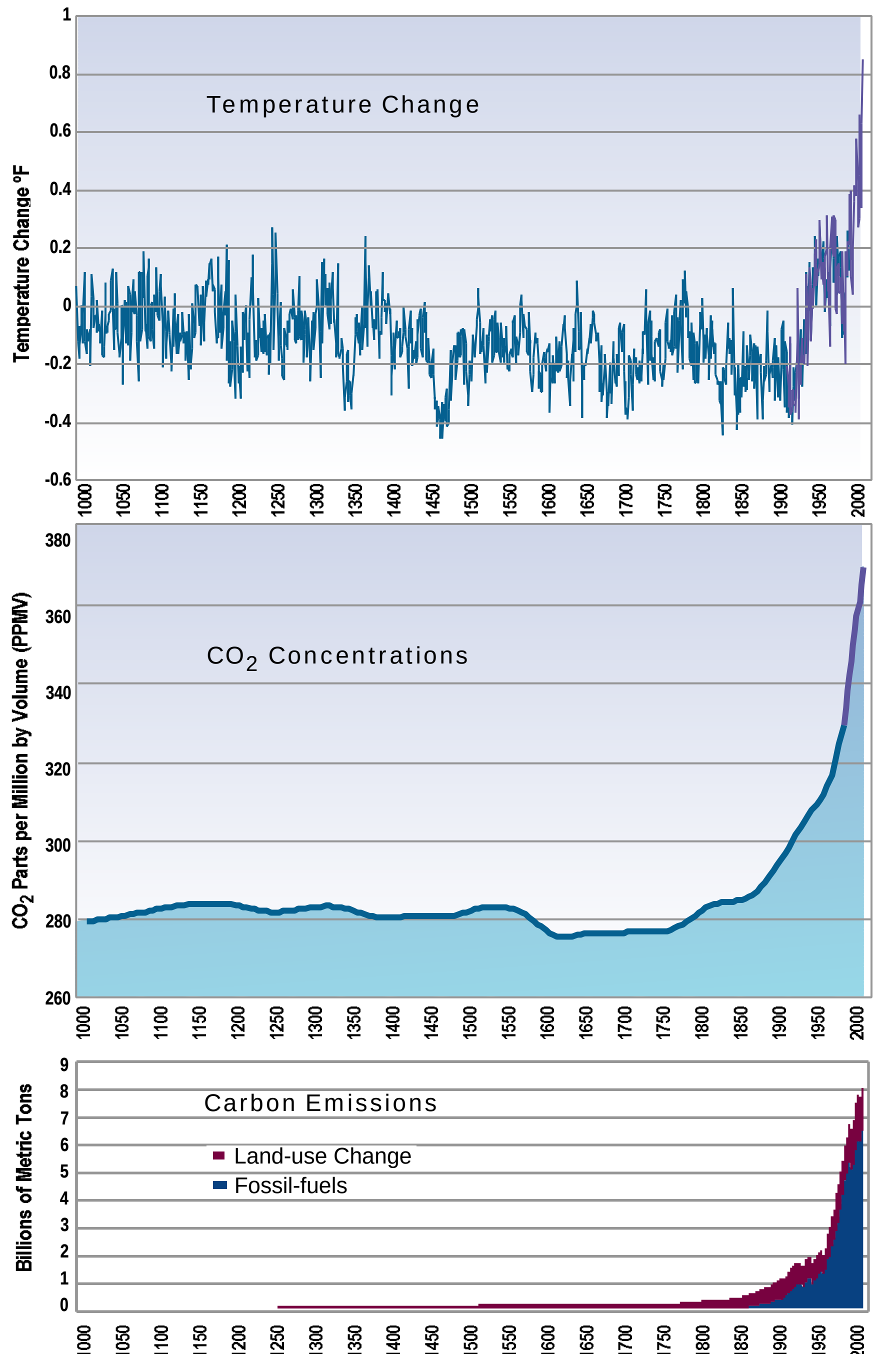
As the Earth warms,more water evaporates from the oceans and lakes, eventually to fall as rain or snow. During the 20th century, annual precipitation has increased about 10% in the mid- and high-latitudes. The warming is also causing permafrost to thaw, and is melting sea ice,snow cover, and mountain glaciers. Global sea level rose 4 to 8 inches (10-20 cm) during the 20th century because ocean water expands as it warms and because melting glaciers are adding water to the oceans.

According to the Intergovernmental Panel on Climate Change (IPCC),scientific evidence confirms that human activities are a discernible cause of a substantial part of the warming experienced over the 20th century. New studies indicate that temperatures in recent decades are higher than at any time in at least the past 1,000 years. It is very unlikely that these unusually high temperatures can be explained solely by natural climate variations.

The intensity and pattern of temperature changes within the atmosphere implicates human activities as a cause.

The relevant question is not whether the increase in greenhouse gases is contributing to warming,but rather, what will be the amount and rate of future warming and associated climate changes,and what impacts will those changes have on human and natural systems.

1000 Years of Global CO_2 and Temperature Change



Records of Northern Hemisphere surface temperatures, CO_2 concentrations, and carbon emissions show a close correlation. Temperature Change: **reconstruction of annual-average Northern Hemisphere surface air temperatures derived from historical records, tree rings, and corals (blue), and air temperatures directly measured (purple).** CO_2 Concentrations: **record of global CO_2 concentration for the last 1000 years, derived from measurements of CO_2 concentration in air bubbles in the layered ice cores drilled in Antarctica (blue line) and from atmospheric measurements since 1957.** Carbon Emissions: **reconstruction of past emissions of CO_2 as a result of land clearing and fossil fuel combustion since about 1750 (in billions of metric tons of carbon per year).**

TOOLS FOR ASSESSING CLIMATE CHANGE IMPACTS

For this study, three tools were used to examine the potential impacts of climate change on the US: historical records, comprehensive state-of-the-science climate simulation models, and sensitivity analyses designed to explore our vulnerability to future climate change. These three tools were used because prudent risk management requires consideration of a spectrum of possibilities.

Historical Records

How do changes in climate affect human and natural systems? Records from the past provide an informed perspective on this question. There have been a number of climate variations and changes during the 20th century. These include substantial warming, increases in precipitation, decade-long droughts, and reduction in snow cover extent. Analyzing these variations, and their effects on human and natural systems, provides important insights into how vulnerable we may be in the future.

Climate Model Simulations

Although Earth's climate is astoundingly complex, our ability to use supercomputers to simulate the climate is growing. Today's climate models are not infallible, but they are powerful tools for understanding what the climate might be like in the future.

A key advantage of climate models is that they are quantitative and grounded in scientific measurements. They are based on fundamental laws of physics and chemistry, and incorporate human and biological interactions. They allow examination of a range of possible futures that cannot be examined experimentally.

Our confidence in the accuracy of climate models is growing. The best models have been carefully evaluated by the IPCC and have the ability to replicate most aspects of past and present climates. Two of these models have been used to develop climate change scenarios for this Assessment. These scenarios should be regarded as projections of what might happen, rather than precise predictions of what will happen.

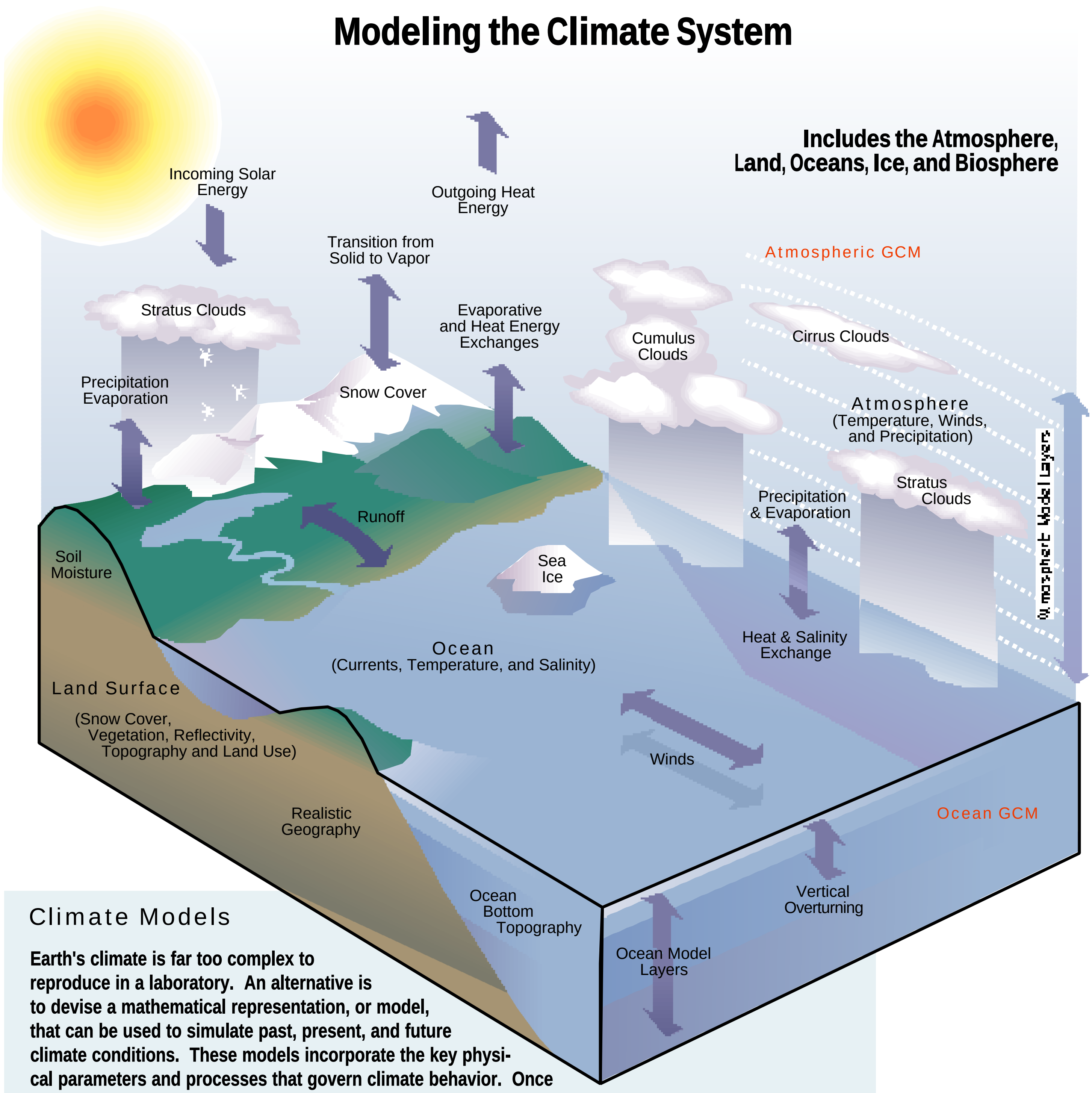
Sensitivity Analyses

What degree of climate change would cause significant impacts to natural and human systems? In other words, how vulnerable and adaptable are we? To help answer such questions, scientists can perform "sensitivity analyses" to determine under what conditions and to what degree a system is sensitive to change. Such analyses are not predictions that such changes will, in fact, occur; rather, they examine what the implications would be if the specified changes did occur. For example, an analyst might ask, "How large would climate change have to be in order to cause a specified impact?"

Climate Observations

Climatologists use two types of data to monitor climate change. The first are historical measurements of temperature, precipitation, humidity, pressure, and wind speed taken at thousands of locations across the globe. Because observing methods, instruments, and station locations have changed over time, climatologists use various methods to crosscheck and corroborate these historical data sets. For example, satellite and balloon records confirm that the planet has been warming for the past four decades, although rates of atmospheric and surface warming differ somewhat from decade to decade. To peer further back into the past, climatologists also analyze physical, biological, and chemical indicators. For example, past climate conditions can be inferred from the width of tree rings, air trapped in ancient ice cores, and sediment deposited at the bottom of lakes and oceans. Taken together, this information demonstrates that the Earth's climate over the past 10,000 years has been relatively stable compared to the 10,000 years that preceeded this period and compared to the 20th century.

Modeling the Climate System



Climate Models

Earth's climate is far too complex to reproduce in a laboratory. An alternative is to devise a mathematical representation, or model, that can be used to simulate past, present, and future climate conditions. These models incorporate the key physical parameters and processes that govern climate behavior. Once constructed, they can be used to investigate how a change in greenhouse gases, or a volcanic eruption, might modify the climate.

Computer models that simulate Earth's climate are called General Circulation Models or GCMs. The models can be used to simulate changes in temperature, rainfall, snow cover, winds, soil moisture, sea ice, and ocean circulation over the entire globe through the seasons and over periods of decades. However, mathematical models are obviously simplified versions of the real Earth that cannot capture its full complexity, especially at smaller geographic scales. Real uncertainties remain in the ability of models to simulate many aspects of the future climate. The models provide a view of future climate that is physically consistent and plausible, but incomplete. Nonetheless, through continual improvement over the last several decades, today's GCMs provide a state-of-the-science glimpse into the next century to help understand how climate change may affect the nation.

TOOLS FOR ASSESSING CLIMATE CHANGE IMPACTS

On average over the US, the Hadley model projects a wetter climate than does the Canadian model, while the Canadian model projects a greater increase in temperature than does the Hadley model.

Scenarios of the Future

Information about the future is valuable, even if it is somewhat uncertain. For example, many people plan their days around weather forecasts with uncertainty conveyed in words or numbers. If there is "a 70% chance of rain" we might take an umbrella with us to work. It may not rain,but if it does, we are prepared. Likewise,although the tools used in this report to explore the possible range of climate change impacts – historical records, computer simulations,and sensitivity analyses – contain uncertainties,their use still provides much valuable information for policymakers,planners,and citizens.

The fact that the climate is changing is apparent from detailed historical records of climate that provide a benchmark for assessing the future. Scientists'understanding of America's future climate – and of the impacts that this altered climate is likely to have on agriculture,human health, water resources,natural ecosystems,and other key issues – has been advanced by the use of computer simulations. Together, the historical record and computer simulations indicate that America's climate is very likely to continue changing in the 21st century, and indeed,that these changes are likely to be substantially larger than those in the 20th century, with significant impacts on our nation.

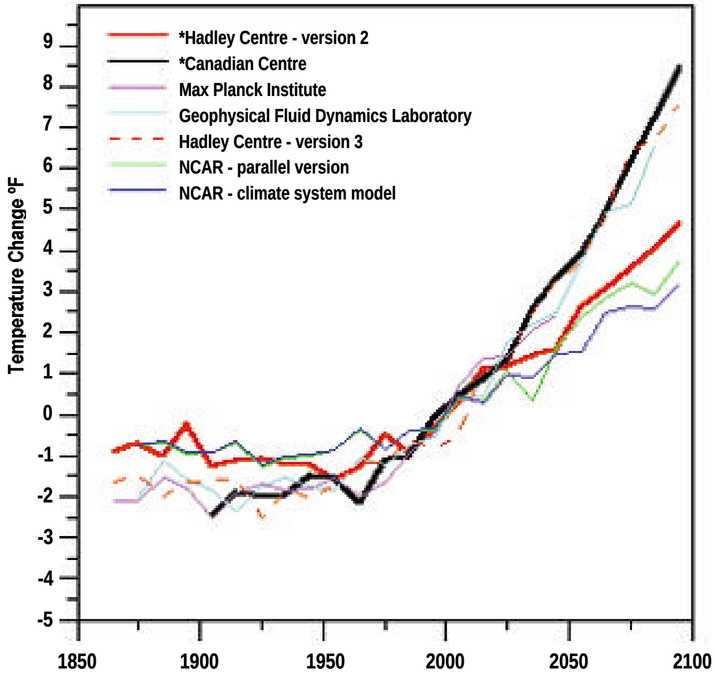
Climate Models used in the US Assessment

Climate models continue to improve,and assumptions about future greenhouse gas emissions continue to evolve. The two primary models used to project changes in climate in this Assessment were developed at the Canadian Climate Centre and the Hadley Centre in the United Kingdom. They have been peer-reviewed by other scientists and both incorporate similar assumptions about future emissions (both approximate the mid-range emissions scenario described on page 4).These models were the best fit to a list of criteria developed for this Assessment.Climate models developed at the National Center for Atmospheric Research (NCAR),NOAA's Geophysical Fluid Dynamics Laboratory (GFDL), NASA's Goddard Institute for Space Studies (GISS),and Max Planck Institute (MPI) in Germany, were also used in various aspects of the Assessment.

While the physical principles driving these models are similar, the models differ in how they represent the effects of some important processes. Therefore,the two primary models paint different views of 21st century climate. On average over the US,the Hadley model projects a much wetter climate than does the Canadian model,while the Canadian model projects a greater increase in temperature than does the Hadley model. Both projections are plausible, given current understanding. In most climate models,increases in temperature for the US are significantly higher than the global average temperature increase. This is due to the fact that all models project the warming to be greatest at middle to high latitudes,partly because melting snow and ice make the surface less reflective of sunlight,allowing it to absorb more heat. Warming will also be greater over land than over the oceans because it takes longer for the oceans to warm.

Uncertainties about future climate stem from a wide variety of factors, from questions about how to represent clouds and precipitation in climate models to uncertainties about how emissions of greenhouse gases will change. These uncertainties result in differences in climate model projections. Examining these differences aids in understanding the range of risk or opportunity associated with a plausible range of future climate changes. These differences in model projections also raise questions about how to interpret model results, especially at the regional level where projections can differ significantly.

Changes in Temperature over the US Simulated by Climate Models



The two primary climate models used in this Assessment have been peer-reviewed and both incorporate similar assumptions about future emissions (both approximate the IPCC "IS92a" scenario with a 1% per year increase in greenhouse gases and growing sulfur emissions).

Simulations from leading climate models of changes in decadal average surface temperature for the conterminous US (excluding Alaska and Hawaii) based on historic and projected changes in atmospheric concentrations of greenhouse gases and sulfate aerosols. The heavy red and black lines indicate the primary models used by the National Assessment. For the 20th century, the models simulate a US temperature rise of about 0.7 to 1.9°F, whereas estimates from observations range from 0.5 to 1.4°F; estimates for the global rise are 0.9 to 1.4°F for models and 0.7 to 1.4°F for observations, suggesting reasonable agreement. For the 21st century, the models project warming ranging from 3 to 6°F for the globe and 3 to 9°F for the US. The two models at the low end of this range assume lower emissions of greenhouse gases than do the other models.

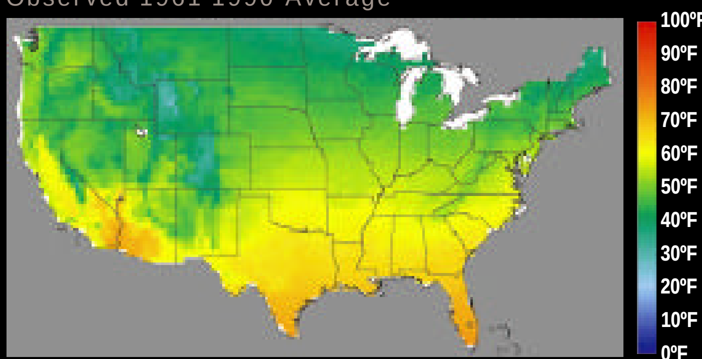
Range of Projected Warming in the 21st Century

	Global	US
*Hadley Model	+5ºF	+5ºF
*Canadian Model	+8ºF	+9ºF
MPI, GFDL and NCAR Models	+3 to 6ºF	+3 to 9ºF

***The two primary models used in the Assessment.**

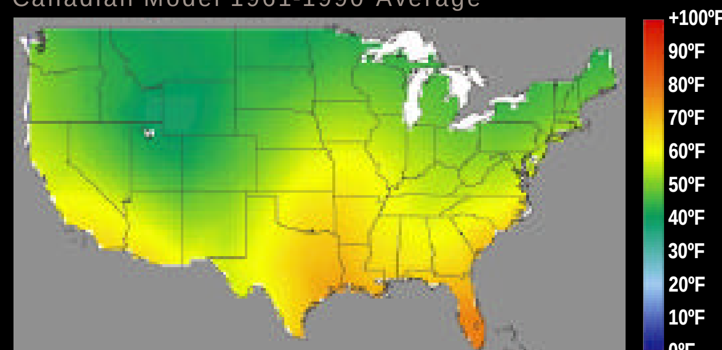
Observed and Modeled Average Annual Temperature

Observed 1961-1990 Average

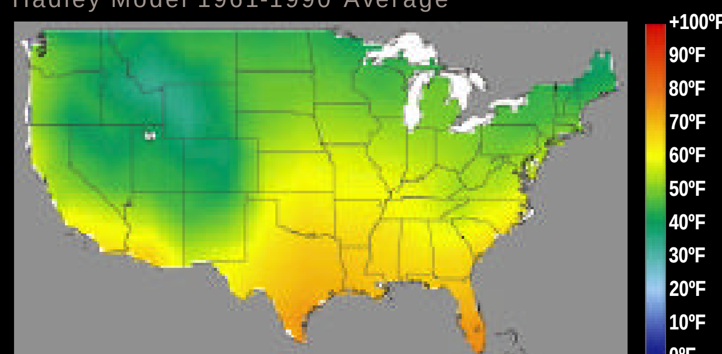


The observed temperature averages for 1961-1990 are similar to the temperatures simulated by the Canadian and Hadley models for the same time period. These are the two primary models used to develop climate change scenarios for this Assessment.

Canadian Model 1961-1990 Average



Hadley Model 1961-1990 Average



TOOLS FOR ASSESSING CLIMATE CHANGE IMPACTS

Interpreting Climate Scenarios

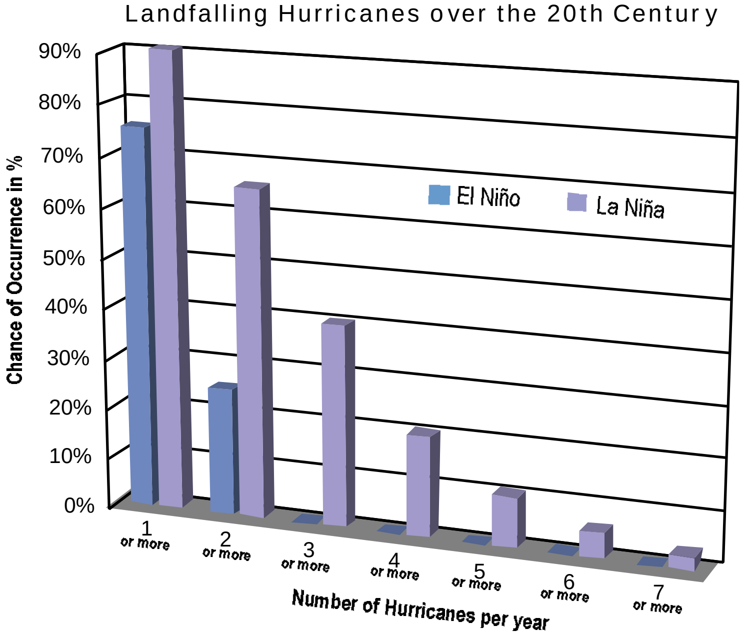
Our level of confidence in climate scenarios depends on what aspect is being considered,and over what spatial scale and time period.Increases in greenhouse gases will cause global temperatures to increase. There is less certainty about the magnitude of the increase,because we lack complete knowledge of the climate system and because we do not know how human society and its energy systems will evolve. Similarly, we are confident that higher surface temperatures will cause an increase in evaporation,and hence in precipitation,but less certain about the distribution and magnitude of these changes.

Model projections of continental-scale and century-long trends are more reliable than projections of shorter-term trends over smaller scales.

The most certain climate projections are those that pertain to large-scale regions,are given as part of a range of possible outcomes,and are applied to trends over the next century. Model projections of continental-scale and century-long trends are more reliable than projections of shorter-term trends over smaller scales. Projections on a decade-by-decade basis,and projections of transient weather phenomena such as hurricanes,are considerably less certain. Two examples serve to illustrate this point. Most climate models project warming in the eastern Pacific, resulting in conditions that look much like current El Niño conditions. When today's existing El Niño pattern is superimposed on this El Niño-like state,El Niño events would likely be more intense,as would their impacts on US weather. Some recent studies suggest that El Niño and La Niña conditions are likely to become more frequent and intense.Other studies suggest little overall change. While these projections must be interpreted with caution,prudent risk management suggests considering the possibility of increases in El Niño and La Niña intensity and frequency.

The projections are less certain regarding changes in the incidence of tropical storms and hurricanes. Some recent studies suggest that hurricanes will become more intense,while others project little change. It is possible that a 5-10% increase in hurricane wind speed will occur by 2100;confirming this remains an important research issue. Perhaps a more important concern is rainfall during hurricanes. One set of model simulations projects that peak precipitation rates during hurricanes will increase 25-30% by the end of the 21st century. Today, El Niño conditions are associated with increased Pacific and decreased Atlantic hurricane frequencies. La Niña is associated with increased Atlantic hurricane frequencies. However, hurricane formation is dependent on a large number of atmospheric and surface conditions. Given these complex dynamics,projections for changes in the frequency and paths of tropical storms must be viewed with caution.

El Niño and La Niña Effects on the Chance of Landfalling Hurricanes over the 20th Century



During El Niño and La Niña years, the chance of landfalling hurricanes on the Gulf and Atlantic coasts changes dramatically, as seen in this chart based on data since 1900. During El Niño years the chance of hurricanes is greatly reduced; no more than two hurricanes have ever made landfall during an El Niño year. On the other hand, during La Niña years, the chance of hurricanes greatly increases; there has been nearly a 40% chance of three or more hurricanes making landfall during a La Niña year.

A Continually Changing Climate and the Potential for Surprises

It is essential to note that the 21st century's climate,unlike that of the preceeding thousand years,is not expected to be stable but is very likely to be in a constant state of change. For example,the duration and amount of ice in the Great Lakes is expected to decrease. It is possible that in the short term an increase in "lake effect" snows would be a consequence during mid-winter, though they would likely decrease in the long term. Across the nation,as climate continues to warm,precipitation is very likely to increasingly fall as rain rather than snow. Such continuously changing climate presents a special challenge for human adaptation.

A continuously changing climate presents a special challenge for human adaptation.

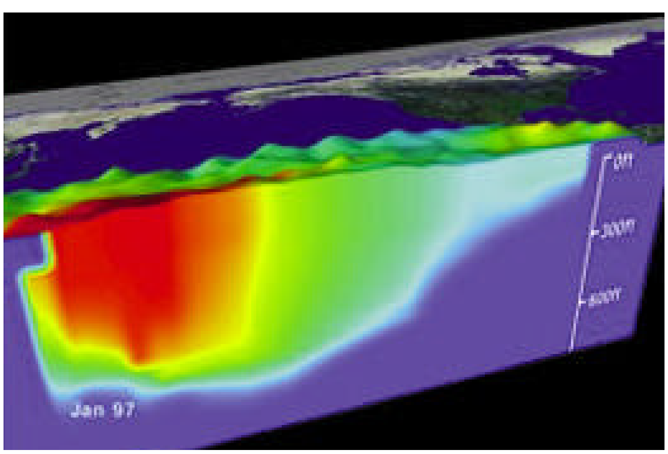
In addition,there is the potential for "surprises." Because climate is highly complex,it is important to remember that it might surprise us with sudden or discontinuous change,or by otherwise evolving quite differently from what is expected. Surprises challenge humans' ability to adapt,because of how quickly and unexpectedly they occur. For example,what if the Pacific Ocean warms in such a way that El Niño events become much more extreme? This could reduce the frequency, but perhaps not the strength,of hurricanes along the East Coast,while on the West Coast,more severe winter storms, extreme precipitation events,and damaging winds could become common. What if large quantities of methane,a potent greenhouse gas currently frozen in icy Arctic tundra and sediments,began to be released to the atmosphere by warming,potentially creating an amplifying "feedback loop" that would cause even more warming? We simply do not know how far the climate system or other systems it affects can be pushed before they respond in unexpected ways.

Because climate is highly complex, it is important to remember that it might surprise us with sudden or discontinuous change.

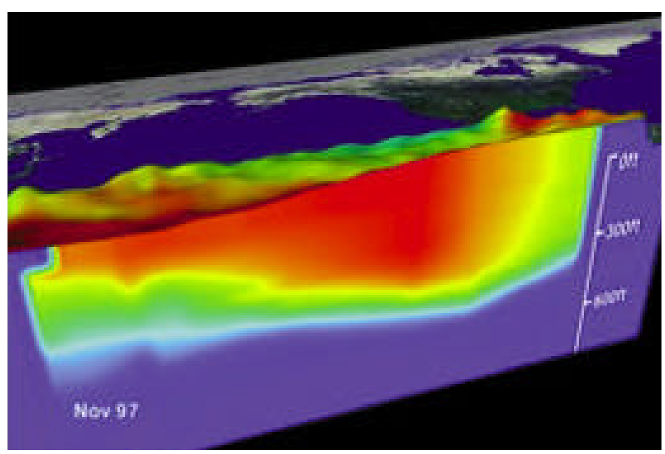
We simply do not know how far the climate system or other systems it affects can be pushed before they respond in unexpected ways.

There are many examples of potential surprises,each of which would have large consequences. Most of these potential outcomes are rarely reported,in this study or elsewhere. Even if the chance of any particular surprise happening is small,the chance that at least one such surprise will occur is much greater. In other words,while we can't know which of these events will occur, it is likely that one or more will eventually occur.

Another caveat is appropriate: climate scenarios are based on emissions scenarios for various gases. The development of new energy technologies,the speed of population growth, and changes in consumption rates each have the potential to alter these emissions in the future,and hence the rate of climate change.



Water temperature profile in the Pacific Ocean, January 1997.



Water temperature profile in the Pacific Ocean, November 1997.

During El Niño conditions, the equatorial pool of warm water (shown in red) expands and moves eastward to span the entire equatorial Pacific east of the dateline. This dramatic warming affects global atmospheric circulation including effects on the jet stream, winter storms, and tropical storms.

LOOKING AT AMERICA'S CLIMATE

Past and Future US Temperature Change

Observations from 1200 weather stations across the US show that temperatures have increased over the past century, on average by almost 1ºF (0.6˚C). The coastal Northeast, the upper Midwest, the Southwest, and parts of Alaska have experienced increases in the annual average temperature approaching 4ºF (2ºC) over the past 100 years. The rest of the nation has experienced less warming. The Southeast and southern Great Plains have actually experienced a slight cooling over the 20th century, but since the 1970s have had increasing temperatures as well. The largest observed warming across the nation has occurred in winter.

Average warming in the US is projected to be somewhat greater than for the world as a whole over the 21st century. In the Canadian model scenario, increases in annual average temperature of 10ºF (5.5ºC) by the year 2100 occur across the central US with changes about half this large along the east and west coasts. Seasonal patterns indicate that projected changes will be particularly large in winter, especially at night. Large increases in temperature are projected over much of the South in summer, dramatically raising the heat index (a measure of discomfort based on temperature and humidity).

In the Hadley model scenario, the eastern US has temperature increases of 3-5ºF (2-3ºC) by 2100 while the rest of the nation warms more, up to 7ºF (4ºC), depending on the region.

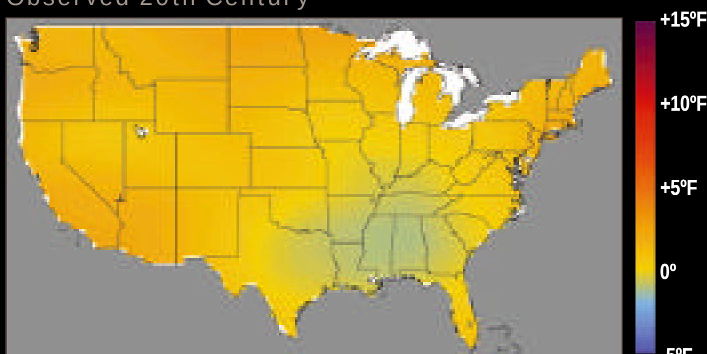
In both models, Alaska is projected to experience more intense warming than the lower 48, and in fact, this warming is already well underway. In contrast, Hawaii and the Caribbean islands are likely to experience less warming than the continental US, because they are at lower latitudes and are surrounded by ocean, which warms more slowly than land.

Both the Canadian and Hadley model scenarios project substantial warming during the 21st century. The warming is considerably greater in the Canadian model, with most of the continental US experiencing increases from 5 to 15˚F. In this model, the least warming occurs in the West and along the Atlantic and Gulf Coasts. In the Hadley model, annual temperatures are projected to increase from 3 to 7˚F, with the largest warming occurring in the western half of the country.

Temperature Change

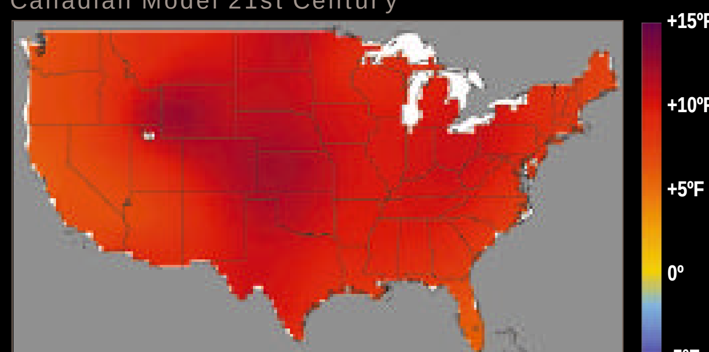
How to read these maps: The color scale indicates changes in temperature in ºF over a 100 year period. For example, at 0ºF there is no change; at +10ºF there is a 10ºF increase from the begining to the end of the century.

Observed 20th Century

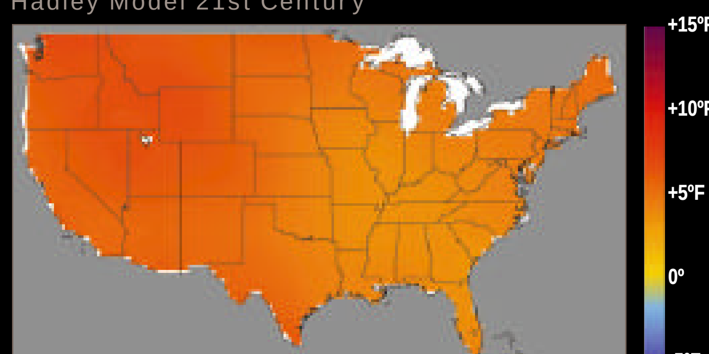


The change in the annual average temperature over the 20th century has a distinctive pattern. Most of the US has warmed, in some areas by as much as 4˚F. Only portions of the southeastern US have experienced cooling, and this was primarily due to the cool decades of the 1960s and 1970s. Temperatures since then have reached some of the highest levels of the century.

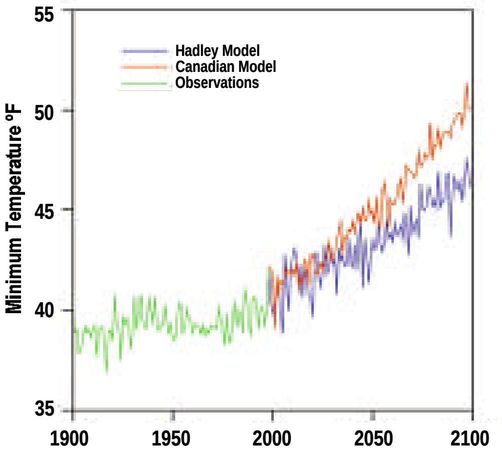
Canadian Model 21st Century



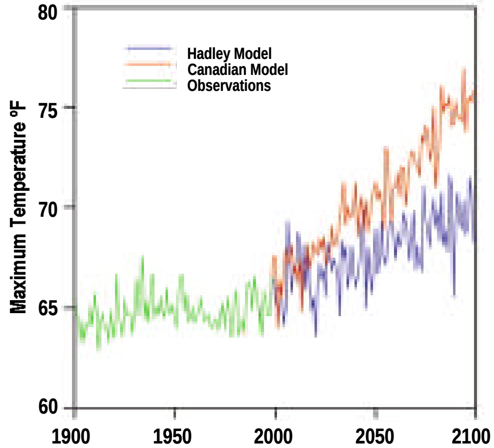
Hadley Model 21st Century



Minimum Temperature
in the US (annual average)



Maximum Temperature
in the US (annual average)



Average US warming is projected to be somewhat greater than global average warming over the 21st century. Large increases in temperature are projected over much of the South in summer, dramatically raising the heat index (a measure of discomfort based on temperature and humidity).

The annual average of minimum and maximum temperatures are compiled from the daily lows and highs. These graphs show the lows and highs, averaged over the year and over the lower 48 states. The green line shows observed temperatues while the red and blue lines are model projections for the future.

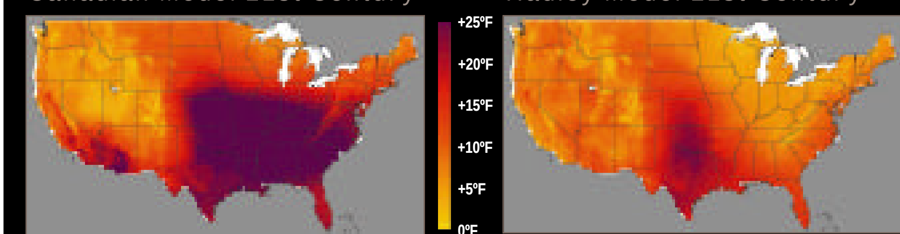
The minimum and maximum temperatures are important because, far more than the average, they influence such things as human comfort, heat and cold stress in plants and animals, maintenance of snowpack, and pest populations (many pests are killed by low temperatures; a rise in the minimum often allows more pests to survive).

July Heat Index Change

The projected changes in the heat index for the Southeast are the most dramatic in the nation with the Hadley model suggesting increases of 8 to 15ºF for the southernmost states, while the Canadian model projects increases above 25ºF for much of the region.

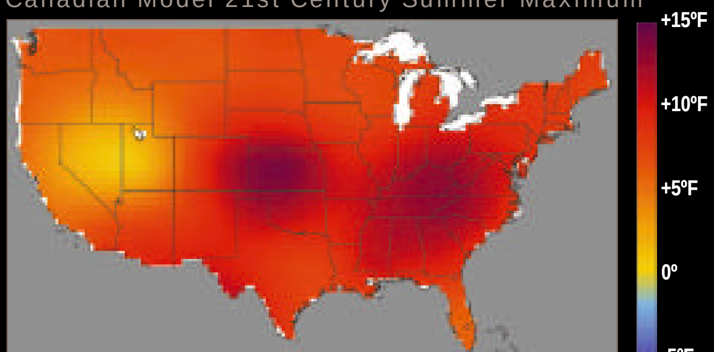
Canadian Model 21st Century

Hadley Model 21st Century

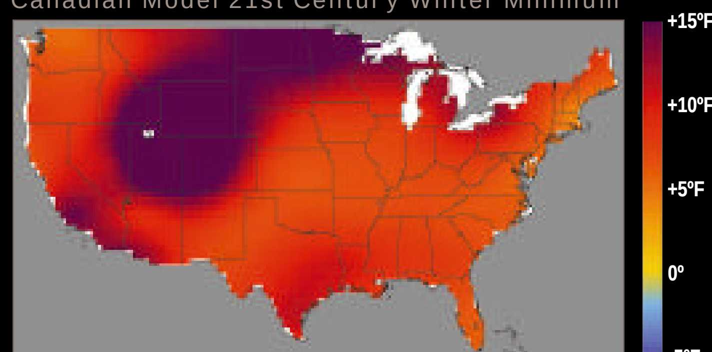


Summer Maximum and Winter Minimum Temperature Change

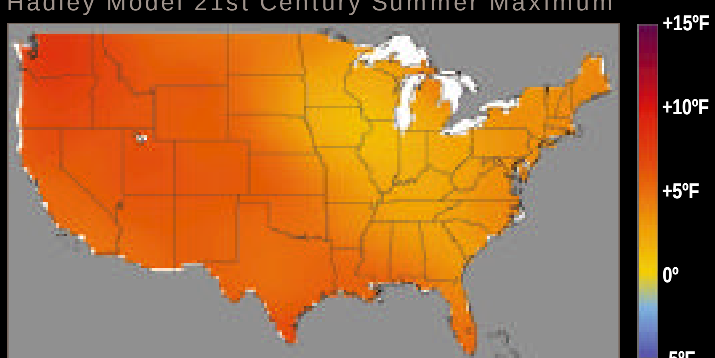
Canadian Model 21st Century Summer Maximum



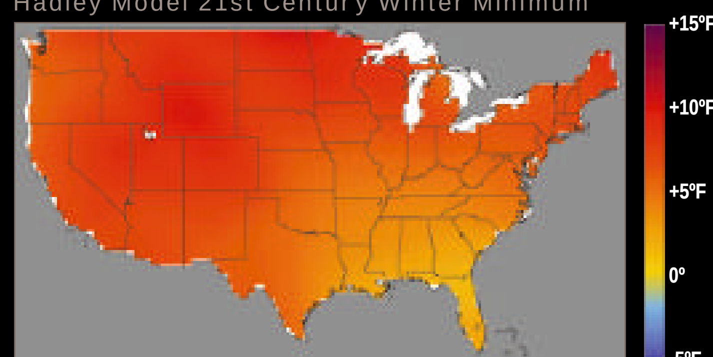
Canadian Model 21st Century Winter Minimum



Hadley Model 21st Century Summer Maximum



Hadley Model 21st Century Winter Minimum



LOOKING AT AMERICA'S CLIMATE

Changes in Precipitation

Average US precipitation has increased by 5-10% over the last century with much of that due to an increase in the frequency and intensity of heavy rainfall. Precipitation increases have been especially noteworthy in the Midwest,southern Great Plains,and parts of the West and Pacific Northwest.Decreases have been observed in the northern Great Plains.

For the 21st century, the Canadian model projects that percentage increases in precipitation will be largest in the Southwest and California,while east of the Rocky Mountains,the southern half of the nation is projected to experience a decrease in precipitation. The percentage decreases are projected to be particularly large in eastern Colorado and western Kansas,and across an arc running from Louisiana to Virginia. Projected decreases in precipitation are most evident in the Great Plains during summer and in the East during both winter and summer. The increases in precipitation projected to occur in the West,and the smaller increases in the Northwest,are projected to occur mainly in winter.

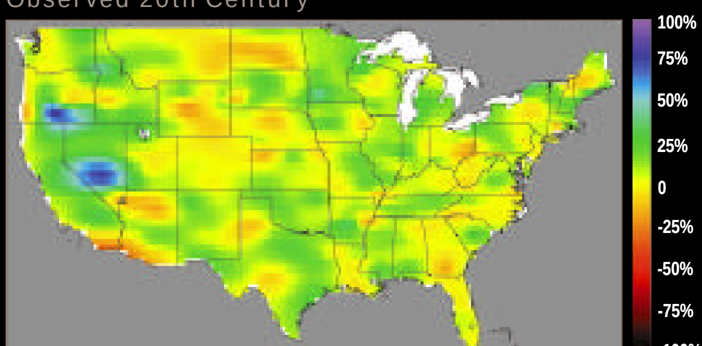
In the Hadley model,the largest percentage increases in precipitation are projected to be in the Southwest and Southern California,but the increases are smaller than those projected by the Canadian model. In the Hadley model,the entire US is projected to have increases in precipitation,with the exception of small areas along the Gulf Coast and in the Pacific Northwest.Precipitation is projected to increase in the eastern half of the nation and in southern California and parts of Nevada and Arizona in summer, and in every region during the winter, except the Gulf States and northern Washington and Idaho.

In both the Hadley and Canadian models,most regions are projected to experience an increase in the frequency of heavy precipitation events. This is especially notable in the Hadley model,but the Canadian model shows the same characteristic.

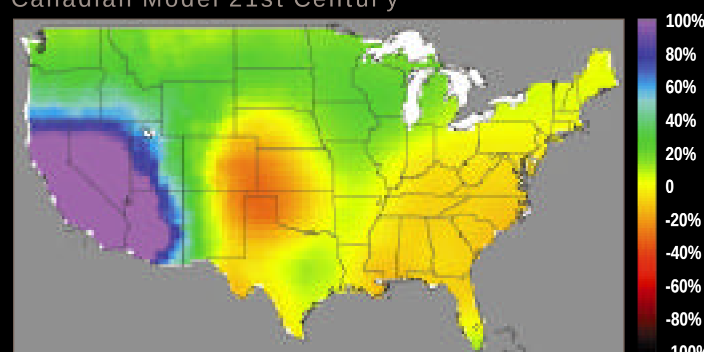
While the actual amounts are modest, the large percentage increases in rainfall projected for the Southwest are related to increases in atmospheric moisture and storm paths. A warmer Pacific would pump moisture into the region and there would also be a southward shift in Pacific Coast storm activity. In the Sierra Nevada and Rocky Mountains, much of the increased precipitation is likely to fall as rain rather than snow, causing a reduction in mountain snow packs.

Precipitation Change

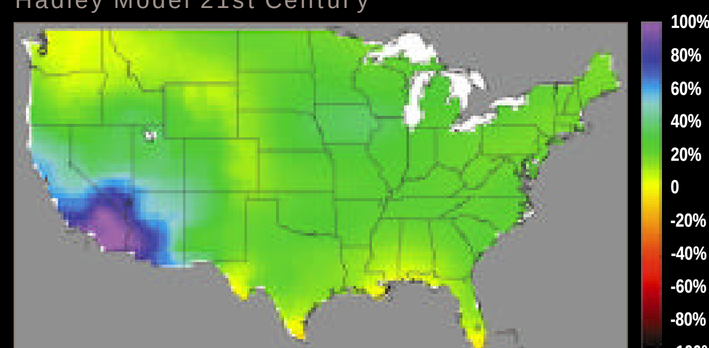
Observed 20th Century



Canadian Model 21st Century



Hadley Model 21st Century



Significant increases in precipitation have occurred across much of the US in the 20th century. Some localized areas have experienced decreased precipitation. The Hadley and Canadian model scenarios for the 21st century project substantial increases in precipitation in California and Nevada, accelerating the observed 20th century trend (some other models do not simulate these increases). For the eastern two-thirds of the nation, the Hadley model projects continued increases in precipitation in most areas. In contrast, the Canadian model projects decreases in precipitation in these areas, except for the Great Lakes and Northern Plains, with decreases exceeding 20% in a region centered on the Oklahoma panhandle. Trends are calculated relative to the 1961-90 average.

This would tend to increase wintertime river flows and decrease summertime flows in the West. Across the Northwest, and the central and eastern US, the two model projections of precipitation change are in less agreement. These differences will be resolved only by improvements in climate modeling.

Changes in Soil Moisture

Soil moisture is critical for both agriculture and natural ecosystems. Soil moisture levels are determined by an intricate interplay among precipitation, evaporation, run-off, and soil drainage. By itself, an increase in precipitation would increase soil moisture. However, higher air temperatures will increase the rate of evaporation and, in some areas, remove moisture from the soil faster than it can be added by precipitation. Under these conditions, some regions are likely to become drier even though their rainfall increases.

In fact, soil moisture has already decreased in portions of the Great Plains and Eastern Seaboard, where precipitation has increased but air temperature has risen.

Since soil moisture projections reflect both changes in precipitation and in evaporation associated with warming, the differences between the two models are accentuated in the soil moisture projections. For example, in the Canadian model, soil moisture decreases of more than 50% are common in the Central Plains due to the combination of precipitation reductions exceeding 20% and temperature increases exceeding 10ºF. In the Hadley model, this same region experiences more modest warming of about 5ºF and precipitation increases of around 20%, generally resulting in soil moisture increases.

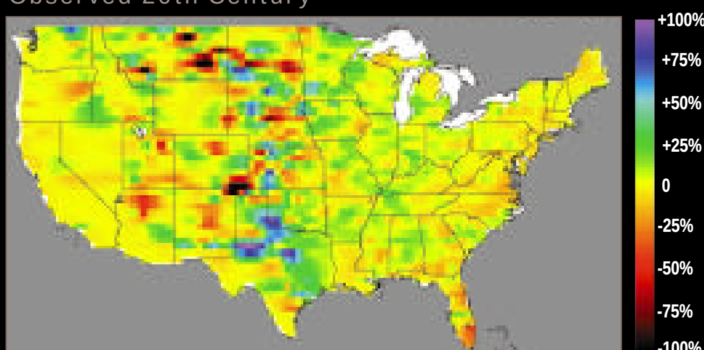
Increased drought becomes a national problem in the Canadian model. Intense drought tendencies occur in the region east of the Rocky Mountains and throughout the Mid-Atlantic-Southeastern states corridor. Increased tendencies toward drought are also projected in the Hadley model for regions immediately east of the Rockies. California and Arizona, plus a region from eastern Nebraska to Virginia's coastal plain, experience decreases in drought tendency. The differences in soil moisture and drought tendencies will be significant for water supply, agriculture, forests, and lake levels.

In both the Hadley and Canadian models, most regions are projected to see an increase in the frequency of heavy precipitation events.

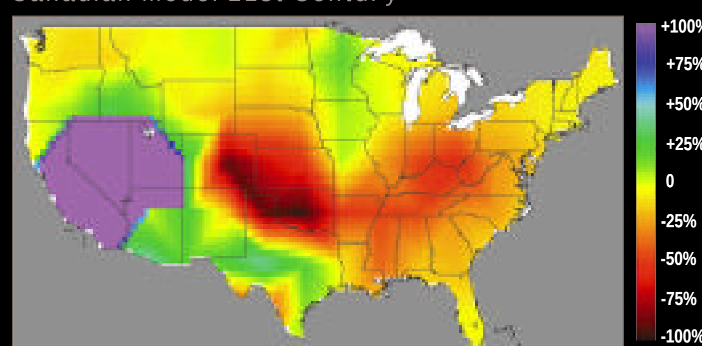
Higher air temperatures will increase the rate of evaporation and, in some areas, remove moisture from the soil faster than it can be added by precipitation.

Summer Soil Moisture Change
(Relative to the 1961-90 Average)

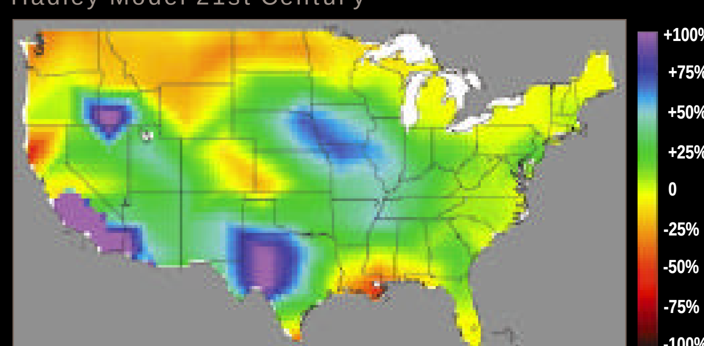
Observed 20th Century



Canadian Model 21st Century



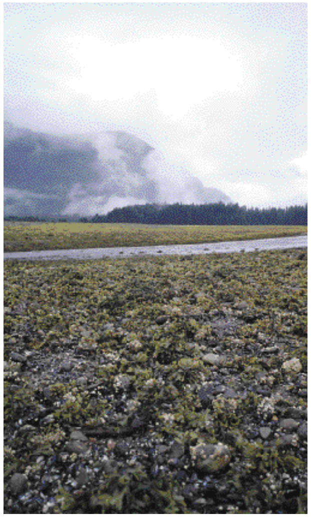
Hadley Model 21st Century



Soil moisture has tended to increase in the central US with decreases in some localized areas. In the Northeast and in the western third of the country, there has been less change in soil moisture, despite the increase in precipitation, due to compensating temperature increases.

The Hadley and Canadian models project strong increases in soil moisture in the Southwest. For the rest of the nation, the Hadley model projects mostly increases while the Canadian model projects mostly decreases, with large decreases in the Central Plains. The contrasts between the two models result from the combination of greater precipitation in the Hadley model and higher air temperatures in the Canadian model.

ECOSYSTEMS IN THE FUTURE



The natural vegetation covering about 70% of the US land surface is strongly influenced both by the climate and by the atmospheric carbon dioxide (CO_2) concentration. To provide a common base of information about potential changes in vegetation across the nation for use in the regional and sector studies,specialized ecosystem models were run using the two major climate model scenarios selected for this Assessment. A summary of the national level results follows. Agricultural and production forestry systems are the focus of separate sections of this Overview report.

What are Ecosystems?

Ecosystems are communities of plants,animals,microbes,and the physical environment in which they exist. They can be characterized by their biological richness, by the magnitude of flows of energy and materials between their constituent species and their physical environment,and by the interactions among the biological species themselves,that is, by which species are predators and prey, which are competitors,and which are symbiotic.

What to Expect with Climate Change

- **Changes in the productivity and carbon storage capacity of ecosystems, decreases in some places and increases in others, are very likely.**

- **Shifts in the distribution of major plant and animal species are likely.**

- **Some ecosystems such as alpine meadows are likely to disappear in some places because the new local climate will not support them or there are barriers to their movement.**

- **In many places, it is very likely that ecosystem services, such as air and water purification, landscape stabilization against erosion, and carbon storage capacity will be reduced. These losses will likely occur in the wake of episodic, large-scale disturbances that trigger species migrations or local extinctions.**

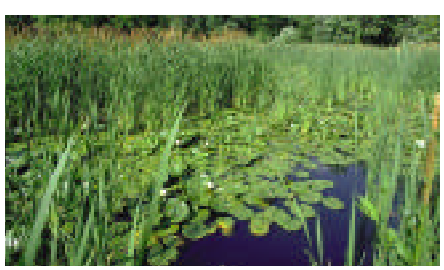
- **In some places, it is very likely that ecosystems services will be enhanced where climate-related stresses are reduced.**

Ecologists often categorize ecosystems by their dominant vegetation – the deciduous broad-leafed forest ecosystems of New England,the short-grass prairie ecosystems of the Great Plains,the desert ecosystems of the Southwest. The term "ecosystem" is used not only to describe natural systems (such as coral reefs,alpine meadows,old growth forests,or riparian habitats),but also for plantation forests and agricultural systems,although these ecosystems obviously differ in many important ways from the natural ecosystems they have replaced.

Ecosystems Supply Vital Goods and Services

While we value natural ecosystems in their own right,ecosystems of all types,from the most natural to the most extensively managed,produce a variety of goods and services that benefit humans. Some of these enter the market and contribute directly to the economy. Thus, forests as sources of timber and pulpwood,and agro-ecosystems as sources of food are important to us. But ecosystems also provide a set of un-priced services that are valuable,but that typically are not traded in the marketplace. There is no current market, for example, for the services that forests and wetlands provide for improving water quality, regulating stream flow, and providing some measure of protection from floods. However, these services are very valuable to society.

Ecosystems are also valued for recreational,aesthetic,and ethical reasons. These are also difficult to value monetarily, but are nevertheless important. The bird life of the coastal marshes of the Southeast and the brilliant autumn colors of the New England forests are treasured components of our regional heritages, and important elements of our quality of life.

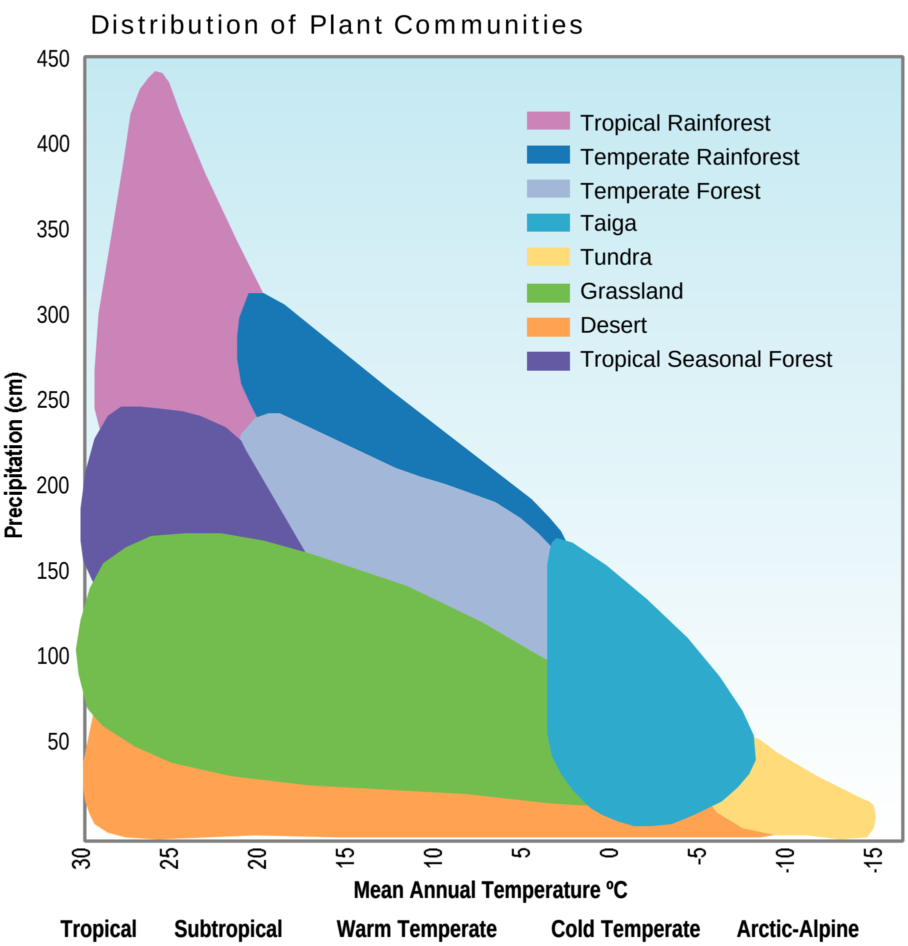


Climate and Ecosystems

Climatic conditions determine where individual species of plants and animals can live, grow, and reproduce. Thus,the collections of species that we are familiar with – the southeastern mixed deciduous forest,the desert ecosystems of the arid Southwest,or the productive grasslands of the Great Plains – are influenced by climate as well as other factors such as land-use. The species in some ecosystems are so strongly influenced by the climate to which they are adapted that they are vulnerable even to modest climate changes. For example,alpine meadows at high elevations in the West exist where they do entirely because the plants that comprise them are adapted to the cold conditions thatwould be too harsh for other species in the region. The desert vegetation of the Southwest is adapted to the high summer temperatures and aridity of the region. Forests in the east are adapted to relatively high rainfall and soil moisture;if drought conditions were to persist, grasses and shrubs could begin to out-compete tree seedlings,leading to completely different ecosystems.

The species in some ecosystems are so strongly influenced by the climate to which they are adapted that they are vulnerable even to modest climate changes.

There are also many freshwater and marine examples of sensitivities to climate variability and change. In aquatic ecosystems, for example,many fish can breed only in water that falls within a narrow range of temperatures. Thus,species of fish that are adapted to cool waters can quickly become unable to breed successfully if water temperatures rise. Wetland plant species can adjust to rising sea levels by dispersing to new locations,within limits. Too rapid sea-level rise can surpass the ability of the plants to disperse,making it impossible for coastal wetland ecosystems to re-establish themselves.



Both temperature and precipitation limit the distribution of plant communities. The climate (temperature and precipitation) zones of some of the major plant communities (such as temperate forests, grasslands, and deserts) in the US are shown in this figure. Note that grasslands' zone encloses a wide range of environments. This zone can include a mixture of woody plants with the grasses. The shrublands and woodlands of the West are examples of grass/woody vegetation mixes that occur in the zone designated as grasslands.

With climate change, the areas occupied by these zones will shift relative to their current distribution. Plant species are expected to shift with their climate zones. The new plant communities that result from these shifts are likely to be different from current plant communities because individual species will very likely migrate at different rates and have different degrees of success in establishing themselves in new places.

ECOSYSTEMS IN THE FUTURE

Effects of Increased CO_2 Concentration on Plants

The ecosystem models used in this Assessment consider not only changes in climate, but also increases in atmospheric CO_2. The atmospheric concentration of CO_2 affects plant species in ecosystems since it has a direct physiological effect on photosynthesis,the process by which plants use CO_2 to create new biological material. Higher concentrations of CO_2 generally enhance plant growth if the plants also have sufficient water and nutrients,such as nitrogen,to sustain this enhanced growth. For this reason, the CO_2 levels in commercial greenhouses are sometimes boosted in order to stimulate plant growth. In addition,higher CO_2 levels can raise the efficiency with which plants use water. Different types of plants respond at different rates to increases in atmospheric CO_2, resulting in a divergence of growth rates due to CO_2 increase. Some species grow faster, but provide reduced nutritional value. The effects of increased CO_2 level off at some point;thus,continuing to increase CO_2 levels will not result in increased plant growth indefinitely. There is still much we do not understand about the CO_2 "fertilization"effect,its limits,and its direct and indirect implications.

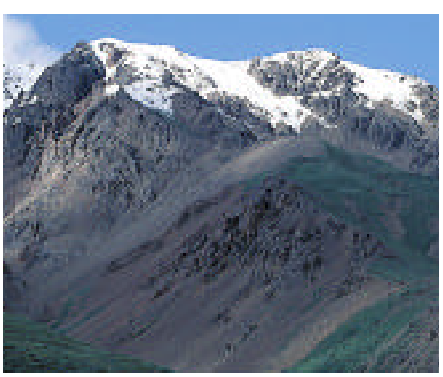
Species in current ecosystems can differ substantially in their tolerances of changes in temperature and precipitation, and in their responses to changes in CO_2; thus, new climate conditions are very likely to result in current ecosystems breaking apart, and new assemblages of species being created.

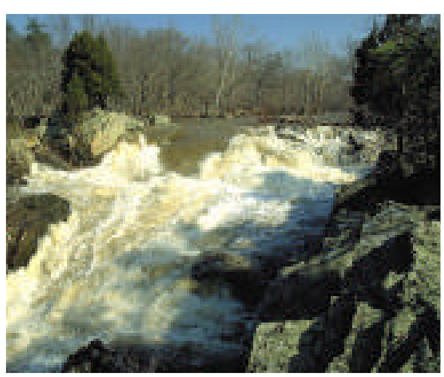
Species Responses to Changes in Climate and CO_2

The responses of ecosystems to changes in climate and CO_2 are made up of the individual responses of their constituent species and how they interact with each other. Species in current ecosystems can differ substantially in their tolerances of changes in temperature and precipitation,and in their responses to changes in CO_2; thus,new climate conditions are very likely to result in current ecosystems breaking apart,and new assemblages of species being created. Current ecosystem models have great difficulty in predicting these kinds of biological and ecological responses,thus leading to large uncertainties in projections.

What the Models Project

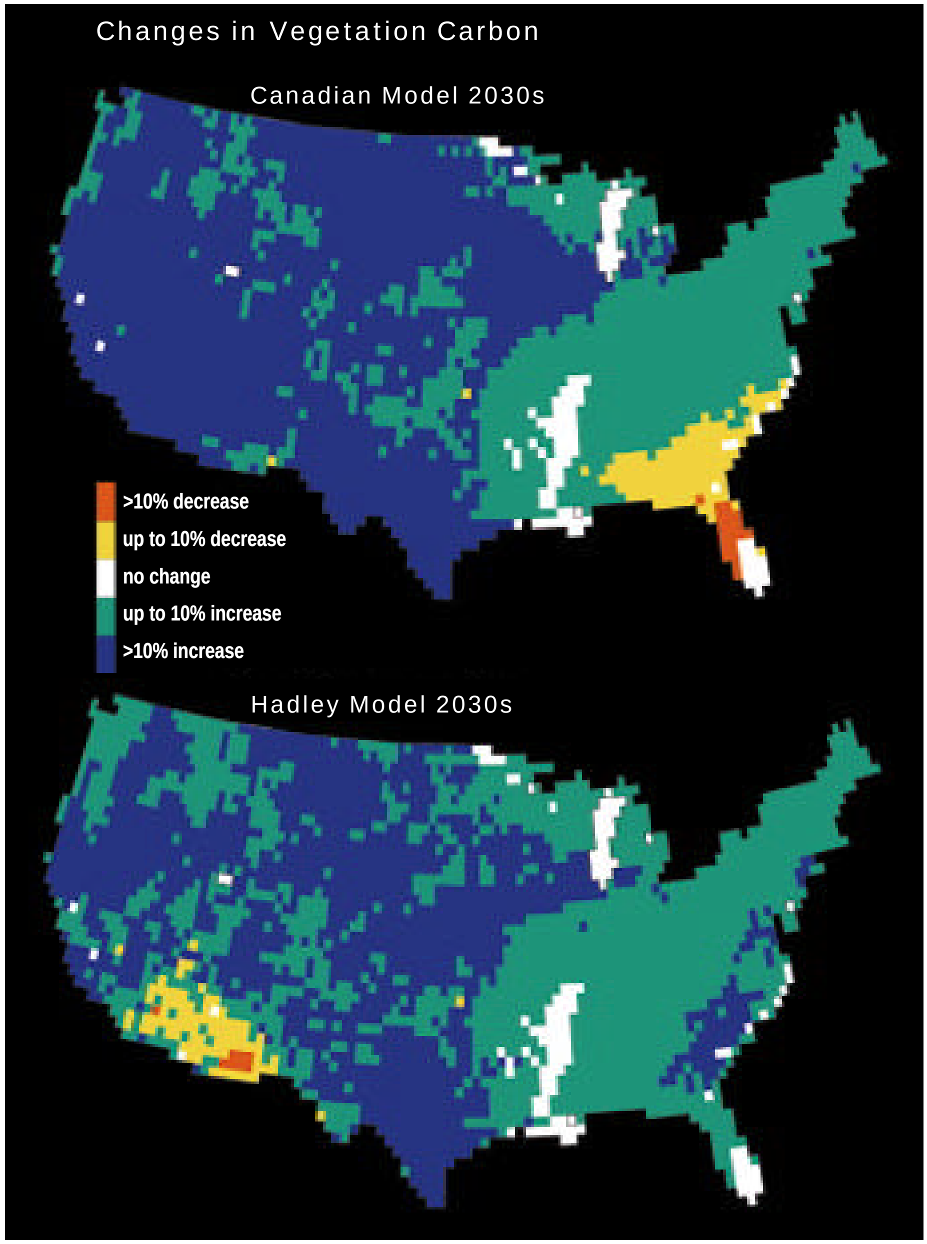
Modeling results to date indicate that natural ecosystems on land are very likely to be highly sensitive to changes in surface temperature,precipitation patterns,other climate parameters,and atmospheric CO_2 concentrations. Two types of models utilized in this Assessment to examine the ecological effects of climate change are biogeochemistry models and biogeography models. Biogeochemistry models simulate changes in basic ecosystem processes such as the cycling of carbon, nutrients,and water (ecosystem function). Biogeography models simulate shifts in the geographic distribution of major plant species and communities (ecosystem structure).



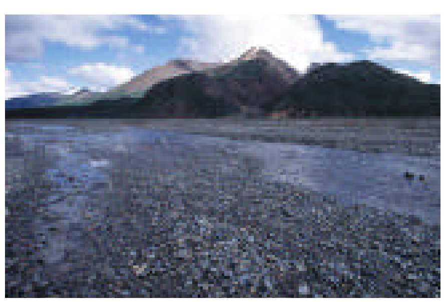


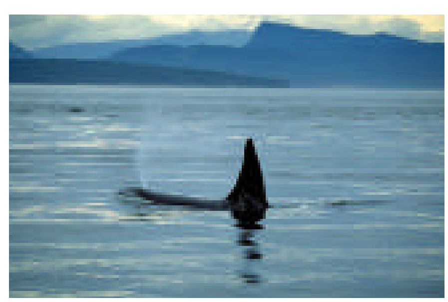
The biogeochemistry models used in this analysis generally simulate increases in the amount of carbon in vegetation and soils over the next 30 years for the continental US as a whole. These probable increases are small – in the range of 10% or less,and are not uniform across the country. In fact, for some regions the models simulate carbon losses over the next 30 years. One of the biogeochemistry models,when operating with the Canadian climate scenario,simulates that by about 2030,parts of the Southeast will likely lose up to 20% of the carbon from their forests. A carbon loss by a forest is treated as an indication that it is in decline. The same biogeochemistry model,when operating with the Hadley climate scenario,simulates that forests in the same part of the Southeast will likely gain between 5 and 10% in carbon in trees over the next 30 years.

Why do the two climate scenarios result in opposite ecosystem responses in the Southeast? The Canadian climate scenario shows the Southeast as a hotter and drier place in the early decades of the 21st century than does the Hadley scenario. With the Canadian scenario, forests will be under stress due to insufficient moisture,which causes them to lose more carbon in respiration than they gain in photosynthesis. In contrast,the Hadley scenario simulates relatively plentiful soil moisture, robust tree growth,and forests that accumulate carbon.



The maps above show projections of relative changes in vegetation carbon between 1990 and the 2030s for two climate scenarios. Under the Canadian model scenario, vegetation carbon losses of up to 20% are projected in some forested areas of the Southeast in response to warming and drying of the region by the 2030s. A carbon loss by forests is treated as an indication that they are in decline. Under the same scenario, vegetation carbon increases of up to 20% are projected in the forested areas in the West that receive substantial increases in precipitation. Output from TEM (Terrestrial Ecosystem Model) as part of the VEMAP II (Vegetation Ecosystem Modeling and Analysis Project) study.





ECOSYSTEMS IN THE FUTURE

Will disturbances caused by climate change be regular and small or will they be episodic and large? The latter category of disturbances is likely to have a negative impact on ecosystem services; the ability of ecosystems to cleanse the air and water, stabilize landscapes against erosion, and store carbon, for example, are very likely to be diminished.

Prolonged stress due to insufficient soil moisture can make trees more susceptible to insect attack,lead to plant death,and increase the probability of fire as dead plant material adds to an ecosystem's "fuel load." The biogeography models used in this analysis simulate at least part of this sequence of climate-triggered events in ecosystems as a prelude to shifts in the geographic distribution of major plant species. One of the biogeography models,when operating with the Canadian climate scenario,simulates that towards the end of the 21st century, a hot dry climate in the Southeast will result in the replacement of the current mixed evergreen and deciduous forests by savanna/woodlands and grasslands,with much of the change involving fire. This change in habitat type in the Southeast would imply that the animal populations of the region would also change, although the biogeography models are not designed to simulate these changes. The same biogeography model,when operating with the Hadley scenario,simulates a slight northward expansion of the mixed evergreen and deciduous forests of the Southeast with no significant contraction along the southern boundary. Other biogeography models show similar results.

Major Uncertainties

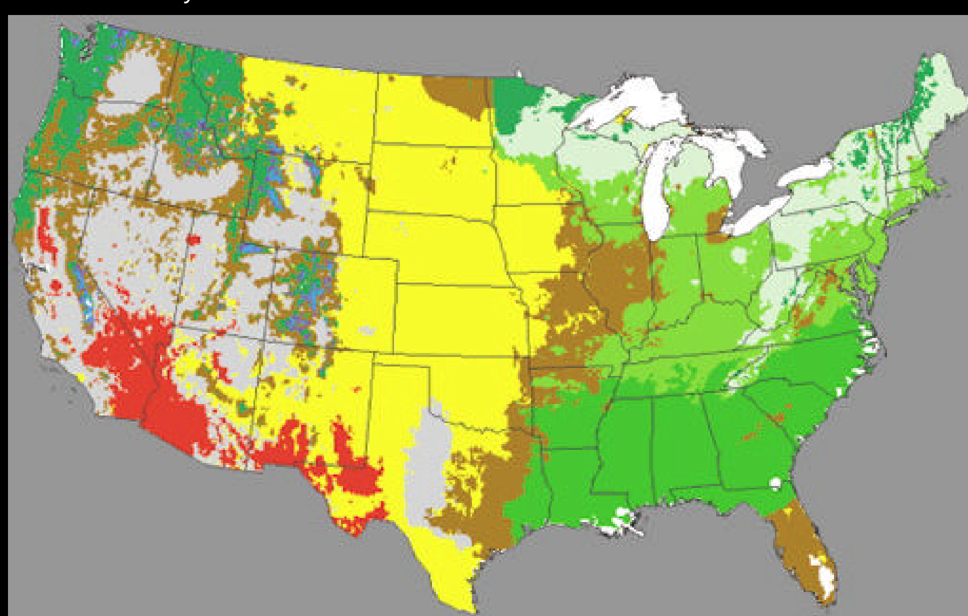
Major uncertainties exist in the biogeochemistry and biogeography models. For example,ecologists are uncertain about how increases in atmospheric CO_2 affect the carbon and water cycles in ecosystems. What they assume about these CO_2 effects can significantly influence model simulation results. One of these models was used to show the importance of testing these assumptions.Consideration of climate change alone

Ecosystem Models

Maps of current and projected potential vegetation distribution for the conterminous US. Potential vegetation means the vegetation that would be there in the absence of human activity. Changes in vegetation distribution by the end of the 21st century are in response to two climate scenarios, the Canadian and the Hadley. Output is from MAPSS (Mapped Atmosphere-Plant-Soil System).

- Tundra
- Taiga / Tundra
- Conifer Forest
- Northeast Mixed Forest
- Temperate Deciduous Forest
- Southeast Mixed Forest
- Tropical Broadleaf Forest
- Savanna / Woodland
- Shrub / Woodland
- Grassland
- Arid Lands

Current Ecosystems

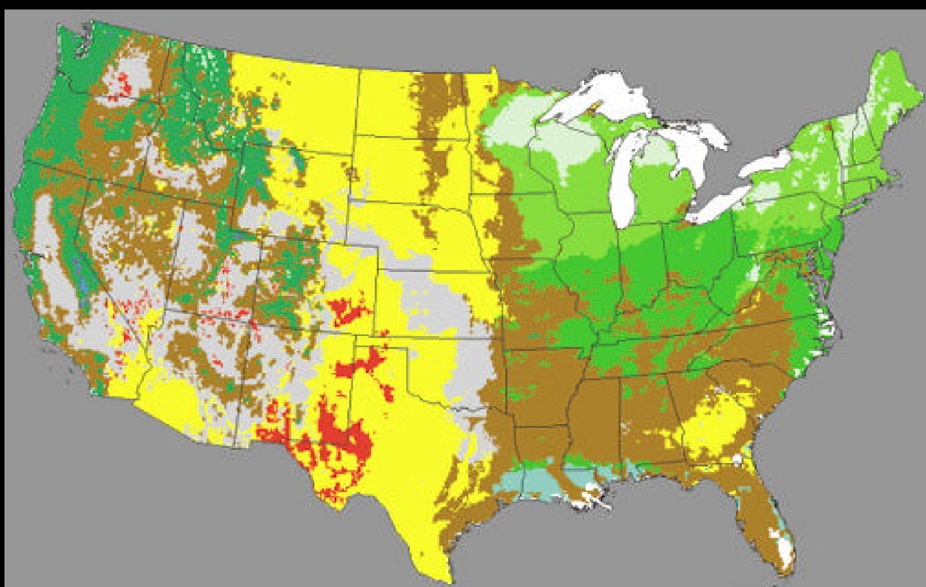


results in a 10% decrease in plant productivity. Consideration of both climate and CO_2 effects results in an increase in plant productivity of 10%. This illustrates the importance of resolving uncertainties about the effects of CO_2 on ecosystems.

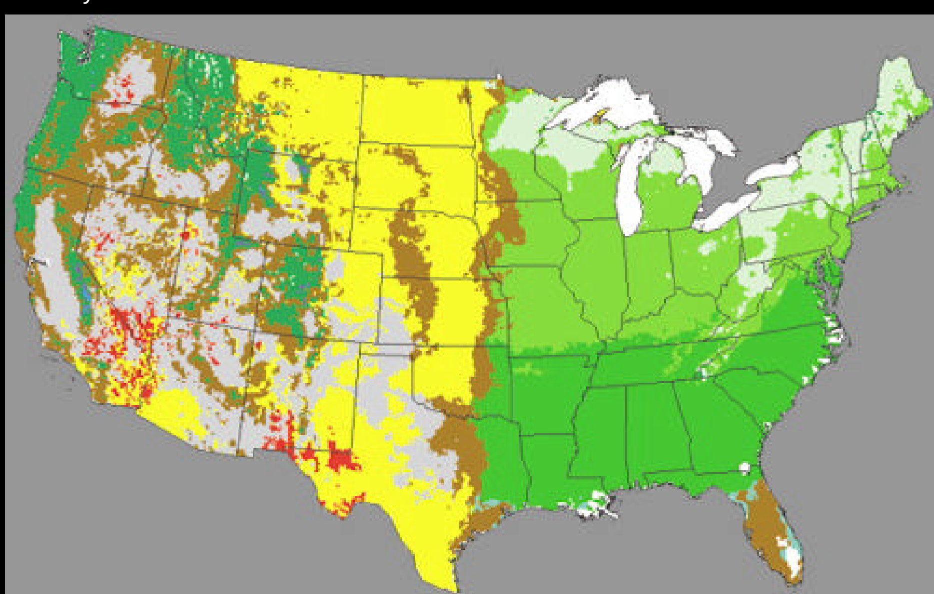
With respect to biogeography models, scientists are uncertain about the frequency and size of disturbances produced by factors such as fire and pests that initiate changes in the distribution of major plant and animal species. Will disturbances caused by climate change be regular and small or will they be episodic and large? The latter category of disturbances is likely to have a negative impact on ecosystems services; the ability of ecosystems to cleanse the air and water, stabilize landscapes against erosion, and store carbon, for example, are very likely to be diminished.

Ecologists are uncertain about how increases in atmospheric CO_2 affect the carbon and water cycles in ecosystems. What they assume about these CO_2 effects can significantly influence model simulation results.

Canadian Model



Hadley Model



A substantial portion of the Southeast's mixed forest is replaced by a combination of savanna and grassland in response to fire caused by warming and drying of the region as projected by the Canadian model. The Hadley climate projection leads to a simulated northward expansion of the mixed forest.

These particular model runs show the response of vegetation to atmospheric concentrations of CO_2 that have stabilized at about 700 parts per million, approximately twice the present level.

In the Southwest, large areas of arid lands are replaced with grassland or shrub/woodland in response to increases in precipitation projected by both models.

Tundra
Taiga / Tundra
Conifer Forest
Northeast Mixed Forest
Temperate Deciduous Forest
Southeast Mixed Forest
Tropical Broadleaf Forest
Savanna / Woodland
Shrub / Woodland
Grassland
Arid Lands

ATTACHMENT 2

Large Attachments to Salton Sea Authority Comment Letter

DATE: **JANUARY 11, 2007**

TO: **SALTON SEA AUTHORITY (RICK DANIELS)**

FROM: **DEL RIO ADVISORS, LLC (KENNETH L. DIEKER)**

RE: **LOCAL FUNDING ALTERNATIVES**
SALTON SEA RESTORATION PLAN

The purpose of this memo is to lay out, in one document, the potential local funding alternatives that are available to the Salton Sea Authority for use in the restoration of the Salton Sea. Few, if any, of these alternatives are available to any other plan as presented to the State of California Department of Water Resources "DWR". This memo is to be inserted into the Salton Sea Authority plan pursuant to the public comment period that ends January 16th, 2007.

SALTON SEA AUTHORITY

The Salton Sea Authority (the "Authority") is a joint powers authority whose member agencies are the County of Riverside, the County of Imperial, Imperial Irrigation District, Coachella Valley Water District, and the Torres Martinez Tribal Nation ("Member Agencies"). The purpose of the Authority is to implement projects for the restoration and revitalization of the Salton Sea and its environs in accordance with federal and state laws. **The Authority has generated a great deal of member, local agency and general public support for its plan to restore the Salton Sea.** To further the purposes of the Authority, local funding sources can provide for the ongoing operation and maintenance costs of certain specific project facilities that the Authority contemplates constructing. Summarized below are a few of the funding alternatives available to the Authority.

INFRASTRUCTURE FINANCING DISTRICT "IFD" (1)

SCOPE OF AUTHORIZING LEGISLATION

We have reviewed the special legislation that authorizes the Salton Sea Authority to form an infrastructure financing district for the restoration of the Salton Sea (Government Code § 53395.9). The section authorizes an IFD "for the purpose of funding the construction of, and purchasing electrical power for, projects for the reclamation and environmental restoration of the Salton Sea". The grant of authority is broad enough to encompass the construction of currently envisioned structures for the reclamation of the Salton Sea.

The only limitation on that power is that "no public funds accruing to the Salton Sea Authority pursuant to this section shall be utilized for purposes of treating or making potable, agricultural tail waters flowing into the Salton Sea". This exclusion was added, we believe, to forestall a perceived intent by commercial water treatment operators to treat and sell agricultural tail waters. It is doubtful that the exclusion would be read broad enough to preclude use of IFD funds for the construction of wetlands or other passive structures designed in part to improve water quality flowing into the Salton Sea.

(SEE "NEW LEGISLATION")

STEPS TO FORM AN INFRASTRUCTURE FINANCING DISTRICT

We have outlined below the required steps for the formation of an Infrastructure Financing District. The process will require a significant amount of time and effort. The Authority is in constant ongoing discussions with the Member Agencies and each Agency has adopted the Authority Plan individually and in cooperation as Member Agencies.

The formal steps necessary for formation of an infrastructure financing district are:

1. Adoption of a resolution of intention to establish the proposed district, describing the boundaries of the proposed district, the type of public facilities proposed to be financed; and fixing a time and place for a public hearing on the proposal (Government Code §53396.10).

2. A resolution of intention is mailed to each owner of land within the district (Government Code §53395.11).

3. Designate and direct the Authority engineer to prepare an infrastructure plan (Government Code §53395.13) that will include the following:

   a) Shall be consistent with the general plan of the underlying land use jurisdictions;

   b) A map and legal description;

   c) Description of public facilities, including proposed location, timing and cost;

d) A finding that the public facilities are of community wide significance and provide significant benefits to an area larger than the area of the district;

e) A financing section, including specification of the maximum portion of incremental tax revenue of affected taxing entities; and projection of the amount of tax revenues expected to be received;

f) A plan for financing the public facilities, including a detailed description of any intention to incur debt;

g) A limit on the total number of dollars of taxes which may be allocated to the district and a date on which the district will cease to exist;

i) An analysis of the cost to the Authority of providing facilities and services to the area of the district while the area is being developed, and after the area is developed, including analysis of the tax, fees, charges and other revenues expected to be received as a result of the expected development;

j) Analysis of the projected fiscal impact on the district and the associated development upon each affected tax entity;

k) A replacement plan for any units of low mod housing that will be removed or destroyed.

4. The Financing Plan shall be sent to landowners and taxing entities (Government Code § 53395.15);

5. The Authority's designated official shall consult with each affected taxing entity regarding revisions to the plan (Government Code §53395.16);

6. The Authority shall conduct a public hearing (Government Code §53395.17);

7. The Authority shall proceed to hear and pass upon all written and oral objections and may modify the plan (Government Code §53395.18);

8. If each affected taxing entity has adopted a resolution approving the plan, the Authority may adopt the plan (Government Code §53395.19);

9. At the conclusion of the hearing, the Authority may adopt a resolution proposing adoption of the infrastructure financing plan and then submit the proposal to qualified electors of the proposed district in the next general election or in a special election to be held. If at least twelve persons have registered to vote, the vote shall be by registered voters of the proposed district. Ballots for the special election may be distributed by mail (Government Code §53395.20); and

10. The Authority may adopt the infrastructure financing plan and create the district if 2/3rds of the votes are cast in favor (Government Code §53395.23).

COMMUNITY FACILITIES DISTRICTS "CFD" (2)

Under the Mello-Roos Community Facilities District Act of 1982 being Government Code Section 53311 et seq., (the "Mello-Roos Act"), a local agency may levy a special tax to finance certain services and facilities in accordance with the requirements set forth in the Mello-Roos Act. A joint powers authority is considered a "local agency" under the Mello-Roos Act and has all of the authority to accomplish the purposes of the Mello-Roos Act. Government Code §53317.

Operation and maintenance services permitted to be financed under the Mello-Roos Act are limited to: (i) maintenance of parks, parkways, and open space; (2) maintenance and operation of flood and storm protection services; (3) maintenance of school facilities; and (4) operation and maintenance of museums and cultural facilities. Government Code §53313. While the Project contains areas and facilities that could be classified as parks, parkways, open space and flood and storm protection facilities, it also contains facilities and areas that are not classified within those categories. Thus, under current law, the full scope of operation and maintenance costs which the Authority would like to finance could not be funded through a community facilities district without special legislation.

(SEE "NEW LEGISLATION")

Pursuant to the Mello-Roos Act, the boundaries of the community facilities district can encompass any and all parcels located within the jurisdiction of the Authority. Included parcels are designated by the local agency and need not be contiguous. Special taxes are levied according to a rate and method of apportionment (basically, a formula created to spread the tax fairly among the parcels). The rate and method of apportionment of the special tax may exempt properties such as those owned by public agencies and Indian tribes. No special benefit finding is needed for a particular parcel to be taxed.

Special taxes to be levied in community facilities districts require approval by a 2/3's majority of the qualified electors, which in the case of the Authority would be registered voters.

ASSESSMENT DISTRICTS (2)

1. Landscaping and Lighting Districts

The Landscaping and Lighting Act of 1972 (the "LLPD Act"), Streets & Highways Code §22500 et seq., permits public agencies to levy assessments for the purpose of maintaining and operating any improvement permitted under the LLPD Act. A public agency is defined as a city, city and county, county or public corporation formed pursuant to a special act for the performance of governmental functions within limited boundaries. Streets & Highways Code §22533. Pursuant to laws governing joint powers authorities, a joint powers authority is a public entity but not a public corporation. Government Code §6507. As such, the Authority would not be able to levy the assessment. The County of Imperial and the County of Riverside (collectively, the "Member Counties"), Member Agencies of the Authority, could each levy the assessment within its jurisdiction and then transfer the funds to the Authority to finance the ongoing operation and maintenance of the Project.

Operation and maintenance costs allowed to be financed by the LLPD Act include costs allocable to improvements for, among other things, public lighting facilities, landscaping, ornamental facilities, park or recreational facilities. Streets & Highways Code §22525. While certain improvements in the Project which need to be financed could be classified into the categories described above, there are improvements, such as the desalinization plant, which would not fit in those categories.

2. Maintenance Districts

Pursuant to Government Code Section 5820 et seq., any City or County may levy assessments to finance the operation and maintenance of improvements. Similar to the LLPD, the maintenance district law does not permit the Authority to levy assessments. Only Cities and Counties are permitted to levy assessments under this law, thus each Member County would need to levy the assessment within its jurisdiction and then transfer the funds to the Authority to finance the operation and maintenance costs of the Project. As there is no limiting definition for the term "improvements," this law provides broad authority for a City or County to operate and maintain any improvements located within its jurisdiction.

CFD AND ASSESSMENT DISTRICT CONCLUSION

It should be noted that while many of the costs of the operation and maintenance of the Project cannot be directly funded through the use of the CFD or Assessment District mechanisms, we want to point out that these dollars will be used to fund public infrastructure for any new planned development and to some extent the ongoing costs of certain public benefits such as schools, police and fire protection. In addition, should the Authority seek special legislative action to amend the "Mello-Roos Act", the dollars could be used for the direct ongoing operation and maintenance costs of the Project.

NEW LEGISLATION

Infrastructure Financing District

It is the intent of the Authority to seek special legislation to allow for the funding of operation and maintenance of any facilities contemplated above through the use of tax increment generated as part of the IFD. There are some bond counsel firms that feel as if the public agency can form a project area as part of an IFD and collect tax increment thereto but, to the best of our knowledge, no one has yet to issue bonds using that revenue as the source of repayment. We intend to seek, as part of our legislative package, clarifying legislation that specifically allows for the issuance of bonds as part of the Salton Sea Authority IFD.

Community Facilities District ("Mello-Roos Act")

The Mello-Roos Act is another practical funding vehicle as it currently could allow the Authority to fully fund some of the operation and maintenance of the Project on its own, without the Member Counties as intermediaries. The Mello-Roos Act could be amended to include operation and maintenance costs for all of the Authority's improvements. The Authority intends to seek special legislative authority under the Mello-Roos Act to fund the operation and maintenance costs of all of its projects by merely adding a section, limited to the Authority, which expands the permissible items for which special taxes may be used to fund operation and maintenance.

OTHER LOCAL FUNDING SOURCES

The following other local funding sources will require participation by one or more of the Authority member agencies:

Transient Occupancy Tax "TOT"

This is generally a tax charged by a local agency to hotel operators / owners for overnight stays within the agency boundaries. This tax is justified since it can be argued that the transient is using the local public facilities and these dollars will be used to help the ongoing maintenance of the local roads, etc. The Salton Sea is in close proximity to the resort areas of the Coachella Valley. It is anticipated that any new recreational activities will bring with it new hotel and resort developments. It would be the desire of the Authority to collect some TOT for the ongoing maintenance of the Project. Any such agreement would require a tax sharing agreement with either or both member counties (Riverside and Imperial).

Sales Tax

While a City or County has jurisdiction to place a sales tax initiative on the ballot. The Authority does not have such direct ability. However, the Authority will pursue legislative action to allow for the creation of a sales tax district that would allow it to capture all or a negotiated portion of the sales taxes generated through the sale of goods and services within the District Boundaries. The Authority would once again need a tax sharing arrangement with either or both member counties to allow some of these sales tax dollars to remain with the Project.

Community Services District

The Authority is a joint powers agency but could promote the formation of a Community Services District "CSD". This CSD would be used to provide services to local residents. The fees and charges for services could include a myriad of items such as water treatment rates, sewer treatment rates, impact fees etc. A portion of these fees and charges could be used for the operation and maintenance costs of the Project. A tax sharing arrangement would need to be worked out with the newly formed CSD to flow some or all of this money to the project.

Tribal Gaming Revenues

While we understand that any gaming revenues are the jurisdiction of the Bureau of Indian Affairs and the State of California, it would be the desire of the Authority to seek participation by the local tribes. They will directly benefit from any recreational or gaming activities and we would hope to garner cooperation with many of the tribes that have lands adjacent to the Sea.

Government Grants and Loans

The Authority is seeking grants and loans from the Federal Government and the State of California. It is anticipated that most of this money would be used for direct project costs. We are looking more to the local funding sources for the annual operation and maintenance costs of our Project. However, some additional government money may be available to offset some of these costs.

Research Institutes

It has been suggested that the Authority try to attract various research institutes. A restored Salton Sea could offer a vast array of research possibilities and would allow the Authority to gain some potential grants and loans associated with such research. We could also generate some direct research fees such as licensing fees from these various institutes. No partners have been identified to date but some parties have expressed an interest in this type of program.

RECREATIONAL FEES

It has also been suggested that the Authority pursue some locally generated fees directly tied to the recreational activities that come from a restored Salton Sea.

Boating Tag

The Authority could charge for an annual boating tag fee that could go to offset some ongoing operation and maintenance of the Project.

State Park Fees

This would require negotiation with the State of California. It has been suggested that the State of California would charge a park fee much like it does for the various other state parks. A surcharge could be added to the fee allowing for the Authority to generate some additional funds for operation and maintenance of the Project.

Four-Wheel Drive and Recreational Vehicle Fees

It has come to our attention that several 4WD groups have annual events at the Salton Sea with participation in the thousands. This untapped wilderness is ideal for such outings and could be combined with a state park fee or other license fees. In addition, it has come to our attention that many recreational vehicle folks actually store their vehicles in the Coachella and Imperial Valleys where they can fly in and then bring their vehicle to the Sea for recreational activities.

Airport

The City of Salton City has a small unimproved private airport. The Authority could approach the Aircraft Owners and Pilots Association "AOPA" to help lobby in seeking funding to build a regional or local public airport to attract private pilots from around the country to participate in the various recreational activities. In addition, the Salton Sea is directly adjacent, on the South side, to the Jacqueline Cochran Regional Airport commonly known as KTRM. This airport has two runways with one exceeding 8,500 ft. This fully improved airport that already has several Fixed Based Operators (FBOs) could eventually be established as a regional air transportation facility serving the Salton Sea recreational area.

THE POWER OF LOCAL FUNDING SOURCES (EXAMPLES)

It has been estimated that a restored Salton Sea could promote the development of 100,000 to 250,000 residential units in the vicinity. This memo does not purport to do any projection of new development but rather demonstrates the potential dollar impacts of local funding mechanisms, particularly the Infrastructure Financing District and Community Facilities District related to such development. The tables below, and the attached schedules in Appendix A-1, A-2 and Appendix B-1, B-2, demonstrate the enormous capacity from local funding sources that the Authority can bring to the table to potentially offset the ongoing operation and maintenance.

The table below illustrates the potential revenue for operations and maintenance generated by adding 2,000 new single-family residential units each year over the 50-year life of the IFD (Total Homes = 100,000). (See Appendix A-1 and A-2)

The table also illustrates how the addition of the same 2,000 units of single-family residential development can fund operations and maintenance through the use of the CFD mechanism. (See Appendix B-1 and B-2)

Funding Source	Annual Revenue	Total Revenue
IFD (1)	$5.3MM - $444.0MM	$9.52BB
IFD (2)	$10.6MM - $888.0MM	$19.05BB
CFD (1)	$3.4MM – $287.2MM	$6.15BB
CFD (2)	$6.8MM - $574.4MM	$12.3BB

Notes
(1) Assumes 2,000 Units Added/Year for 50 Years (Total = 100,000 Units)
(2) Assumes 4,000 Units Added/Year for 50 Years (Total = 200,000 Units) Net of In-Tract

Some CFD capacity (we assumed ½ already netted from the above numbers) would be used for in-tract improvements (sewers, sidewalks, schools, fire / police protection, etc.) through the issuance of bonds.

The table below shows the potential bonding capacity and net project proceeds available through the two mechanisms should the Authority choose to issue bonds for project construction or expansion instead of operation and maintenance:

Financing Source	Bond Amount	Net Proceeds (3)
IFD (1)	$3,961,484,091	$3,486,106,000
IFD (2)	$7.922,968,182	$6,972,212,000
CFD (1)	$2,550,777,443	$2,244,684,150
CFD (2)	$5,101,554,887	$4,489,368,300

Notes
(1) Assumes 2,000 Units Added/Year for 50 Years (Total = 100,000 Units)
(2) Assumes 4,000 Units Added/Year for 50 Years (Total = 200,000 Units) Net of In-Tract
(3) Represents the Net Amount of Bond Proceeds after Funding Reserve Funds and Paying the Costs of the Financing

This memo describes the benefit of economic development to the Project. The numbers become very significant very fast. The problem faced by the Authority is that, much like the line from the movie Field of Dreams "if you build it they will come", we need help from Federal and State sources or some combination thereof to help finance the upfront costs of the Project. However, we feel confident that, through the use of the local funding sources, the Authority and the member agencies can offset the annual operation and maintenance costs of the Project.

CONCLUSIONS

The Authority has generated a great deal of member, local agency and general public support for our plan to restore the Salton Sea. While many of the other alternatives may cost less, they have environmental impacts that could be potentially negative by their very nature. Our plan can be environmentally positive and provide not only wildlife habitat but a myriad of recreational opportunities. In addition, it does not appear that any of the other plans have a local funding component. While none of the proposed local options can pay for the entire cost of any Project they can pay for most or all of the operation and maintenance of the contemplated facilities.

While many of the other local and state fee alternatives would help to offset some of the annual operation and maintenance costs of the Project, the IFD mechanism offers the most promise and most available direct money for ongoing operation and maintenance dollars. Secondarily, the CFD mechanism may provide for a certain amount of backup funding either for ongoing operation and maintenance dollars or in-tract infrastructure. In addition the Authority, in cooperation with the Member Agencies, will work together to utilize any of the other funding alternatives that the Authority cannot do independently.

Any special legislation will incorporate provisions that will allow the Authority to benefit directly from the IFD and CFD funding mechanisms. In addition, through the help and cooperation of our local Member Agencies, we will use all other local funding alternatives available to the Authority and Member Agencies to further our goal of restoration of the Salton Sea. This includes revitalization of wildlife habitat, heading off an environmental disaster while enhancing the recreational opportunities to Californians.

Sources

(1) Portions Excerpted from Memo Dated April 7th 2004 by Best Best &Krieger LLP
(2) Portions Excerpted from Memo Dated September 19th 2005 by Best Best &Krieger LLP

ATTACHMENT 3

Large Attachments to Salton Sea Authority Comment Letter

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A Preliminary Investigation of the Potential Non-Market Benefits Provided by the Salton Sea

Final Report

prepared for

Mr. Rick Daniels
Director, Salton Sea Authority

January 10, 2007

Executive Summary

Environmental and natural resources are assets that provide returns to society now and in the future. Therefore decisions regarding the restoration or preservation of such resources should consider not only the costs of preservation but the benefits, as well. Consideration of the benefits of preservation is exceedingly important when the resource in question is unique and when decisions pertaining to the provision of such services can have irreversible consequences. The Salton Sea is one such resource that provides a set of unique natural resource services, including critical habitat to over 400 species of migratory and resident birds, approximately fifty of which have garnered special status as threatened, endangered, or species of concern. As emphasized in Shuford et al. (2002; p. 255), the Sea is a "vital migratory stopover and wintering habitat for species that breed elsewhere in Western North America," and the health of many of the populations that reside, roost, feed, or nest are dependent on the health of the Salton Sea. As succinctly put by Cohen and Hyun (2006), "The Salton Sea provides critically important habitat to a diversity and abundance of birds." Furthermore, the California State Resources Agency (2006; Chapter 1) citing Cooper (2004) suggests that the Salton Sea has "become an internationally significant stopover site for hundreds of thousands of transients moving north and south along the 'Pacific Flyway', and east into the Great Basin/Prairie Pothole region as well as the winter home for hundreds of thousands of individuals of numerous species from around North America."

With rising salinity levels and increasing pollutant loads, the ability of the Sea to continue to serve as a vibrant ecosystem providing habitat for the avian populations currently using it and the fish species that have traditionally relied on it is unlikely. Furthermore, under the Quantification Settlement Agreement (QSA) signed in 2003 that transfers water from agricultural users to urban users, the outlook is even bleaker because salinity levels will increase more rapidly than currently observed and the loss of inflow volume will lead to less shoreline and quality habitat. The outcome of this trend in habitat degradation and loss could be significant, both for the Salton Sea in its ability to serve its historic function as a habitat for both birds and fish, and for the existence and health of particular bird and fish populations themselves.

While discussions associated with restoring and preserving the Salton Sea have traditionally focused on the costs of various options, very little formal discussion has addressed the potential returns of such an investment. Consideration of the benefits of preservation or restoration has precedence at both federal and state levels. At the federal level, agencies have been mandated under executive orders (e.g., EO 12866 under President Clinton) to choose those alternatives that maximize net benefits (i.e., the difference between total benefits and total costs). At the state level, the State of California, under the California Environmental Quality Act (CEQA), may take into account the economic and social effects associated with any project to assist in determining the significance of the physical changes associated with a particular project (CEQA Guidelines, section 15131(b)). And it should be emphasized that even when much of the preservation benefits consists of non-market value, many state and federal agencies have not only acknowledged such benefits, but also quantified them for guidance in their resource allocation decisions. Examples of such agencies include: the U.S. Department of Interior under the Comprehensive Environmental Response, Compensation, and Liability Act (1980), the National Oceanic and Atmospheric Administration under the Oil Pollution Act (1990), the U.S. Army

Corps of Engineers, the U.S. Bureau of Reclamation, the U.S. Water Resources Council, and state fish and game agencies in Oregon, Nevada, California, Idaho, and Maine. Examples of applications include: Glen Canyon Dam, Hell's Canyon, Mono Lake in California, the spotted owl in the Pacific Northwest, and Kootenai Falls in Montana.

The purpose of this report is to provide some preliminary estimates that are suggestive of the potential value associated with preserving the Salton Sea. Indeed, as an advisory arm of the federal government, the National Resource Council (2004; Executive Summary) argued recently that "assigning a dollar figure" to non-market ecosystem services "…are a must to accurately weight the trade-offs among environmental policy options." Failure to include a measure of the value of ecosystem services in benefit-cost calculations will implicitly assign them a value of zero, which we know is incorrect as evidenced by the body of literature that has estimated the monetary value of similar services.[1] This literature is quite extensive and includes values derived for all manner of ecosystems, including tropical rainforests, wetlands, deserts, and a variety of marine environments.

Although time constraints do not permit a primary valuation study or a formal statistical analysis of previous research at this time, this report does provide an estimated range of annual benefits from the Sea using the "value transfer" method. This method involves deriving updated estimates of habitat or species preservation values from previous research that has performed a primary valuation study or meta-analysis, and then transferring these values to the Salton Sea. To derive these updated estimates, we undertook a thorough search of the environmental and natural resource economics literature on ecosystem service valuation, focusing on the services provided by the Sea that tend to benefit geographically dispersed populations rather than just the local population. Our search included the EconLit database, the Environmental Valuation Reference Inventory (EVRI; the largest database on valuation studies), Google Scholar, and our own private collections of literature on natural resource valuation. Our initial searching and screening of these sources and topics produced around 70 studies. Subsequent screenings narrowed the list to 23 studies of which 20 included at least one value with potential relevance for the Salton Sea.

Of these 23 studies, we determined that those addressing wetlands and wildlife in the San Joaquin Valley (SJV) and those addressing the Mono Lake ecosystem are most relevant and provide the most useful benefits estimates for the Salton Sea. Keeping in mind the uniqueness of the Salton Sea—which we believe tends to increase its value while also making it difficult to transfer benefits estimates from previous research—and the caveats we provide throughout this report, we believe that a conservative order-of-magnitude estimate of the non-market benefits provided to the residents of California by a restored and preserved Salton Sea would be in the range of \$1-\$5 billion annually. This estimated range includes both use and non-use value, but probably mostly non-use value.

Some additional considerations are worth mentioning when interpreting this estimated range of preservation benefits. First, assuming the transferability of the SJV and Mono Lake estimates is high (something we cannot determine with certainty without conducting a primary valuation

[1] Wilson and Carpenter (1999), for example, provide a summary of the economic value of freshwater ecosystem services in the U.S., noting 30 refereed published articles in the scientific literature from 1971 to 1997.

study of the Salton Sea), we are inclined to believe that these value transfers probably underestimate the total non-market value of the Sea. We believe the SJV estimates are low primarily because they value only wetland habitat. The other attributes of the Sea clearly have positive values that are not included in this estimate. We believe the Mono Lake estimate is low primarily because the Sea is significantly larger than Mono Lake and, in our judgment, it is a more important component of the Pacific Flyway. Furthermore, we believe the higher Mono Lake estimates by Loomis (1987, 1989) may be provide better comparison values for the Sea because they are based on a relatively worse no-action scenario. Compared to the no-action scenario considered in the Mono Lake EIR (JSA 1993), we think the no-action scenario considered by Loomis is more similar to that for the Salton Sea.

Finally, we emphasize that these estimates are suggestive. The characteristics of the resources on which our estimates are based, as well as peoples perceptions/values of those characteristics, likely differ from the services provided by the Salton Sea and how these services are perceived/valued. This is what Freeman refers to as differences in “supply side” and “demand side” factors (Freeman 2003; p. 454). Yet based on the results of Loomis (2000) who evaluated six different resource preservation programs, residents within the states where these sorts of unique and threatened resources are located only hold a fraction (approximately 13%) of their national value. Furthermore, as estimated in Loomis and White (1996) through their meta-analysis of valuation studies for rare, threatened, and endangered species, the authors find that even for the most costly endangered species preservation efforts, the benefits are likely to exceed the costs. Hence, while our estimates are suggestive, there are many reasons to believe that these estimates are good first round approximations, and most likely conservative approximations at that, of the value with preserving the Salton Sea.

Table of Contents

I. Introduction

Environmental and natural resources are assets that provide returns to society now and in the future. As such, decisions as to the restoration or preservation of such resources should consider not only the costs of such preservation, but the returns associated with preservation. Consideration of the benefits of preservation is exceedingly important when the resource in question is unique, and when such decisions can have irreversible consequences pertaining to the provision of such services. The Salton Sea provides a set of unique environmental and natural resource services, such as critical habitat for both the endangered desert pupfish and over 400 species of migratory and resident birds, approximately fifty of which have garnered special status as threatened, endangered, or species of concern. While discussions associated with restoring and preserving the Salton Sea have traditionally centered around the costs of various options, very little discussion, at least formally, has involved the potential returns of such an investment. California State Senator Denise Ducheny inferred as much when she emphasized that the merits of any particular restoration strategy should not be based on initial cost estimates alone.[2]

To date, there has been no formal quantification of the existence and preservation benefits associated with the Salton Sea. Indeed, as an advisory arm of the federal government, the National Resource Council (2004; Executive Summary) argued recently that "assigning a dollar figure" to non-market ecosystem services "…are a must to accurately weight the trade-offs among environmental policy options." Failure to include some measure of the value of ecosystem services in benefit-cost calculations will implicitly assign them a value of zero, which we know is incorrect and unnecessary since plenty of analyses exist that have estimated the monetary value of similar services.[3] This literature is quite extensive and includes values derived for all manner of ecosystems, including tropical rainforests, wetlands, deserts, and a variety of marine environments. In light of this information and methods, the National Resource Council (2004) made the following recommendations:

- Policymakers should use economic valuation as a means of evaluating the trade-offs involved in environmental policy choices; that is, an assessment of benefits and costs should be part of the information set available to policymakers in choosing among alternatives.
- If the benefits and costs of a policy are evaluated, the benefits and costs associated with changes in ecosystem services should be included along with other impacts to ensure that ecosystem effects are adequately considered in policy evaluation.
- Economic valuation of changes in ecosystem services should be based on the comprehensive definition embodied in the total economic value (TEV) framework; hence, both *use* and *non-use* values should be included (Arrow et al. 1993).[4]

[2] Remarks by State Senator Ducheny at "The Salton Sea Centennial Symposium", San Diego, Ca., April 1, 2005

[3] Wilson and Carpenter (1999), for example, provide a summary of the economic value of freshwater ecosystem services in the U.S., noting 30 refereed published articles in the scientific literature from 1971 to 1997.

[4] *Use* values are those values society places on the tangible uses of goods and services whereas *non-use* values are those values society places on intangible uses. Complete definitions and examples are given in section II.

With these recommendations in mind, the intention of this report is to provide some preliminary estimates that are suggestive of the value associated with preserving the Salton Sea. Our approach involves developing updated estimates of habitat or species preservation values from research that has performed a primary valuation study or meta-analysis. This simple benefits transfer approach is outlined in Freeman (2003) and Rosenberger and Loomis (2003). To develop these estimates, which we assume can be suggestive of potential value associated with characteristics of the eight Salton Sea Restoration alternatives versus the no-action alternatives as outlined under the Salton Sea Ecosystem Restoration Draft PEIR, we undertook a thorough search of the environmental and natural resource economics literature on ecosystem service valuation, focusing on the types of services that tend to benefit geographically dispersed populations, rather than just the local population residing in the immediate vicinity of the resource. From this survey, we identify the aggregate and disaggregate (e.g., per acre of habitat preserved or per household) preservation value estimates that may serve as starting points for valuing preservation of the Salton Sea.[5]

Because time constraints restrict us from performing a primary valuation study or a meta-regression, either of which would provide a more accurate and reliable estimate, we therefore employ a more straightforward value transfer method (Rosenberg and Loomis, 2003) using existing research that provides estimates from other studies to be used as a benchmark for possible preservation values for the Salton Sea and can serve two important roles. First, these estimates can provide policy makers with an idea of the preservation benefits from other studies of similar, albeit not identical, habitat. Second, this exercise highlights the importance of and value in performing a more concrete and extensive study so as to better pinpoint the preservation estimates associated with a particular restoration alternative. Of course, all the caveats of using this simple benefits transfer method, as pointed out in Freeman (2003) and Rosenberger and Loomis (2003), apply.

The report is organized as follows. Section II provides a brief discussion of the Salton Sea, with particular attention to the services that may be lost in lieu of any restoration plan as well as the legal and regulatory underpinnings that seem to motivate some sort of restoration. Elements of eight restoration alternatives as outlined in the Salton Sea Ecosystem Restoration Draft PEIR (Draft PEIR; California State Resources Agency 2006) are discussed briefly. In section III, a brief discussion of environmental and natural resource non-market valuation is provided, with particular attention given to non-use values, in the context of benefit-cost analysis. Section III also includes a brief discussion of legal and regulatory framework supporting non-market valuation. Case studies that have estimated the preservation values of ecosystem goods and services are presented in section IV, along with a short description of our research methodology. Finally, section V provides the conclusions.

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[5] While the authors are aware of two studies that have attempted to estimate the economic value of preserving the Salton Sea—CIC Research (1989) and the Inland Empire Economic Database and Forecasting Center (IEEC 1998)—neither of these studies estimated non-market values; rather their main focus was on expenditures, changes in property values, and tax revenues generated from those property value changes.

II. The Salton Sea: Services, Legislation, and Elements of the Restoration Plans

The Salton Sea, a terminal lake located in Southern California 35 miles north of the U.S.-Mexico Border, has a total surface area of nearly 370 square miles making it the largest body of water in California as measured by surface area (Cohen and Hyun 2006). While lakes have existed in the present site in the past, the current configuration was formed in 1905 due to an unanticipated dam breach. The elevation of the Sea is relatively stable currently, at around 238 feet below mean sea level. This elevation is maintained by agricultural drainage inflows primarily from the Imperial and Coachella Valleys. The salinity and nutrient-laden constituency of the inflow, coupled with the fact that the Salton Sea is a terminal lake, leads to increasing levels of salinity and nutrient loadings with each year. Currently, Salton Sea salinity levels are around 46,500 mg/L, approximately 1/3rd saltier than the ocean; the nutrient-rich inflows from agricultural drainage have resulted in the Sea being a very productive ecosystem with high biological activity yet with very low levels of dissolved oxygen concentrations.

II.1 Biological Services

Over the past 100 years, the Salton Sea has become a very unique and productive ecosystem. Currently, the Sea provides habitat to over 400 species of birds and a variety of other wildlife species. In recent years, over one-half a million water birds have been observed in and around the Sea, and nearly 3.5 million eared grebes (Jehl and McKernan 2002). This valuable avian habitat has supported more than 50 species that are officially considered threatened, endangered, or *species of concern*. As outlined in Cohen and Hyun (2006) and elsewhere[6], the Sea provides habitat to the federally endangered brown pelican, nearly 40% of the entire U.S. population of federally endangered Yuma clapper rails, more than 90% of the North American population of eared grebes, approximately 30% of the entire North American population of white pelicans, and nearly 50% of the world's population of mountain plovers (Shuford et al. 2002). As highlighted in Shuford et al. (2002), the Salton Sea provides habitat to 19 species of water birds that are considered species of high conservation concern. As an aquatic habitat, the Sea supports a number of fish species, including the federally endangered desert pupfish. Large populations of Tilapia, Orangemouth Corvina, Sargo, and Gulf Croaker have been present.

As a system, the Sea provides a very unique and important habitat. As emphasized in Shuford et al. (2002; p. 255), it is a "vital migratory stopover and wintering habitat for species that breed elsewhere in Western North America," and the health of many of the populations that reside, roost, feed, or nest are dependent on the health of the Salton Sea. As succinctly put by Cohen and Hyun (2006), "The Salton Sea provides critically important habitat to a diversity and abundance of birds." Furthermore, the California State Resources Agency (2006; Chapter 1) citing Cooper (2004) suggests that the Salton Sea has "become an internationally significant stopover site for hundreds of thousands of transients moving north and south along the 'Pacific Flyway', and east into the Great Basin/Prairie Pothole region as well as the winter home for hundreds of thousands of individuals of numerous species from around North America."

[6] For instance, see the Salton Sea Authority webpage (www.SaltonSea.org).

Yet, with increases in salinity and nutrients, and the loss and degradation of substitute habitat elsewhere (Dahl et al. 1997), the future portends grave concern for many of these species. Indeed, declining water quality from increased salinity and pollutant loadings has all but eliminated the marine fish species. Barring major human intervention, the ability of the Sea to continue to serve as a vibrant ecosystem providing habitat for the avian populations currently using it and the fish species that have relied on it is unlikely. Furthermore, under the Quantification Settlement Agreement (QSA) signed in 2003 that transfers water from agricultural users to urban users, the outlook is even bleaker. The transfer water will come from agricultural users in the Imperial Irrigation District mostly through fallowing and water conservation schemes, thereby resulting in less drainage water flowing into the Salton Sea; consequently, salinity levels will increase even more rapidly than currently observed.

While the exact outcome associated with the no-action alternative is unknown, researchers at the Pacific Institute has made some predictions. On the physical and chemical aspects of the Sea, Cohen and Hyun (2006; page i) suggest:

> The amount of water flowing into the Sea in the next twenty years will decrease by more than 40%, causing its surface elevation to drop by more than 20 feet, rapidly shrinking its volume by more than 60%, tripling its salinity….

Consequently, the biological outcome from these changes include (ibid 2006; p. i):

> Many—if not most—of the hundreds of thousands of birds that currently use the Sea will lose their roosting and breeding habitats and their sources of food. The Sea's fish will be almost entirely gone within a dozen years. Those birds that remain will suffer from disease and the reproductive deformities and failures that plagued the Kesterson National Wildlife Refuge twenty years ago. Some of the endangered and threatened species that use the Sea may be able to find other habitats, but others could suffer significant population losses.

Finally, the report concludes that (ibid 2006; p. iii):

> The future loss of food sources and the loss of habitat as the Sea recedes will eliminate the ecological value of the Salton Sea for most of the birds that currently use it. The loss of this critically important breeding habitat and refueling stopover for migrating birds will be felt throughout western North America.

II.2 Anthropocentric Services

From an anthropocentric perspective, the losses in habitat, fish, and avian species and diversity have implications. This diverse habitat has provided many benefits to society, particularly on the recreational front. Millions of people have visited the Salton Sea for such activities as camping, fishing, birding, photography, boating, and other water-related activities. Given the diversity and magnitude of the bird populations, visitors worldwide visit the Salton Sea to see the birds (personal communication, T. Miller, Southwest Birders, December 2006), often during the

Salton Sea International Bird Festival, which has held an annual event since 1997. Alternatively, the Sea has been considered one of the most productive fisheries in the world (Cohn 2000), especially during the years from 1960 to 2000. For instance, in 1969, the Salton Sea experienced nearly 1.5 million visitors, 2/3rd of which were for sport fishing (Harris et al. 1969). In 1987, there were nearly 2.6 million visits by recreators to the Salton Sea, making it a more visited site than Yosemite National Park (CIC Research 1989).

Recreational opportunities due to the services provided by the Salton Sea occur at a number of locals in the Imperial, Coachella, and Riverside counties (see the Draft PEIR, Chapter 13, for a more complete description of these establishments and the services they provide). Recreational opportunities such as swimming, water skiing, sport fishing, and boating have been available around the Salton Sea shoreline. At the Sonny Bono Salton Sea National Wildlife Refuge, which was established in 1930 as the Salton Sea National Wildlife Refuge, critical habitat exists for the Pacific Flyway; furthermore, this area is considered one of the premier bird watching locations in the nation, if not the world (California State Resources Agency 2006, p. 13-4). Opportunities such as wildlife observation, photography, picnicking, and nature trails also exist at the Sonny Bono Refuge, which has averaged nearly 32,000 visitors annually since 1990.

Another popular destination for recreation that is reliant on the restoration of the Salton Sea is the Salton Sea State Recreational Area (SRA). Located along 15 miles of Salton Sea shoreline, the SRA has provided camping, boating, swimming, waterskiing, and angling opportunities. Season-high recreational visits occurred in the 1960s, with nearly 660,000 visitors. Since the mid-1990s, though, visitation rates have ranged from around 100,000 to nearly 282,000 annually.

Additional locations for recreation and for the preservation of these valuable and unique resources, especially in the aggregate as a biologically rich and diverse ecosystem, exist in and around the Salton Sea (e.g., the Wister and Hazard Wildlife Areas in the Imperial County). All of these activities will be threatened with the continual degradation of the Salton Sea. In the Draft PEIR it is noted that under a no-action policy, hunting and birdwatching opportunities would be reduced compared to existing conditions. As mentioned earlier, fish populations would decline even further than recently observed. As of 2000, there was a substantial decline in all sport fish, and marine fish have not been detected in the Department of Fish and Game gill net samples since mid-May 2003. Tilapia still exist, but their populations are down to 10% of those levels observed in the early 1990s. Fishing and recreational boating activities have practically vanished. In the 1980s, there were eight boat launching facilities around the Salton Sea, whereas today only one remains. Without the diversity and abundance of avian and marine species, and with the ever-decreasing water quality conditions, recreational visits for hunting, photography, boating, camping, picnicking, and birdwatching will decrease.

Another loss associated with the degradation of the Sea, and perhaps the largest loss, does not necessarily come from the loss to current users of the Sea, but rather from people that care about the Sea regardless of whether they tangibly use the Sea currently. People have been observed benefiting from environmental resources, and willing to pay to protect them, just by knowing the resources exists. For example, Sanders et al. (1990) estimates what people are willing to pay (i.e., their value) for preserving free flowing rivers with no intention of ever visiting them. Alternatively, Olsen et al. (1991) estimate peoples willingness to pay (value or benefits) for maintaining salmon migrations, again, without actively engaging in any recreation activities (e.g., fishing, photography) involving these salmon. As will be expounded on in the next section, this sort of value is called a non-use or passive-use value and captures that value people have for resources for possible future use by themselves, future use by future generations, current use by others, or simply because they think it is the right or moral thing to do.

II.3 Legislation and Additional Responses by Governmental Agencies

Governmental response to these potential threats has occurred as early as 1992, when Congress enacted the Reclamation Projects Authorization and Adjustment Act (Public Law 102-575), which officially recognized that Salton Sea restoration was in the *interest of the nation*. In particular, it required the Secretary of Interior to conduct research to identify a means to reduce and control salinity, provide endangered species habitat, enhance fisheries, and protect human recreational values in the area of the Salton Sea. At the more local level, the Salton Sea Authority (SSA) was formed in 1993 as a joint powers authority by the approval of Imperial and Riverside Counties, along with the Imperial Irrigation District (IID) and Coachella Valley Water District (CVWD). The SSA was charged with managing and operating the Salton Sea so as to improve recreational activities/opportunities, and improve water quality. In 1998, Congress passed the Salton Sea Reclamation Act of 1998, which charged the Secretary of the Interior to perform feasibility studies and cost analyses of options for restoring the Salton Sea. The goal of these investigations included finding solutions to restore recreational uses, maintain a productive fishery, and provide a safe, productive environment for birds and endangered species (Glenn et al. 1999). A final federal act, the Water Supply, Reliability, and Environmental Improvement Act of 2004 (Public Law 108-361), required the Secretary of the Interior to complete a feasibility study on a preferred alternative for the restoration of the Salton Sea in coordination with the State of California and the SSA.

At the state level, a number of bills were enacted, and collectively referred to as the QSA legislation. One outcome of these bills was the Salton Sea Restoration Act (California State Fish and Game Code Section 2930), which charges the State of California to undertake the restoration of the Salton Sea ecosystem and provide permanent protection of the wildlife dependent on that ecosystem. The Salton Sea Restoration Act required that California identify a preferred alternative from a list of possible restoration alternatives. The preferred alternative was to provide for the maximum feasible attainment of the following objectives related to avian and marine species:

- Restoration of long term stable aquatic and shoreline habitat for the historic levels and diversity of fish and wildlife that depend on the Sea;
- Protection of water quality.

II.4 Elements of Salton Sea Restoration Draft PEIR

As outlined in the Draft PEIR (Chapters 2 and 3), eight alternative restoration plans are presented and evaluated versus two no-action alternatives. Associated with each of the restoration alternatives is the provision of a Saline Habitat Complex and/or Partial Sea that is intended to provide similar or improved habitat relative to what currently exists for the marine and avian species that have historically been present at the Salton Sea. These alternative habitat configurations would provide food, nesting, and roosting habitat, as well as adequate stopover and wintering habitat for those birds migrating along the Pacific Flyway.

Specifically, the Saline Habitat Complex, as outlined in the Draft PEIR (pp. 2-24), is to provide "a mosaic of shallow and deep water habitats with islands and snags that would be similar to the habitat located near the confluences of the New, Alamo, and Whitewater rivers and the Salton Sea and shallow shoreline habitat. This type of habitat has been extremely productive for both fish and wildlife at the Salton Sea..." The salinity levels of the Saline Habitat Complex would range from 20,000 mg/L to 200,000 mg/L, and "could be located in areas that could provide relatively shallow water along the shorelines."

For the Partial or Marine Sea, a number of objectives have been slated to be included, such as:

- Salinity of 30,000 to 40,000 mg/L to maintain marine sea water quality;
- Water surface elevation of -230 feet mean sea level to maintain the shoreline as close as possible to existing conditions;
- Partial Sea water to be located near communities on the western and eastern shorelines, and managed wildlife and agricultural areas along the southern shoreline.

Together, the Marine Sea and the Saline Habitat Complex are to provide services that maintain or build upon the quality of such services in the past, including: fishing, boating, water skiing, bird watching, hiking, hunting, swimming, camping, and other sorts of activities (e.g., biking).

In terms of habitat that could be considered substitute habitat for current habitat, or perhaps even an improvement upon current habitat, the eight alternatives provide the following:

- Alternative 1: 38,000 acres of Saline Habitat Complex.
- Alternative 2: 75,000 acres of Saline Habitat Complex.
- Alternative 3: 61,000 acres of Marine Sea.
- Alternative 4: 88,000 acres of Concentric Lakes that would serve a similar role as the Saline Habitat Complex.
- Alternative 5: 45,500 acres of Saline Habitat Complex; 62,000 acres of Marine Sea.
- Alternative 6: 29,000 acres of Saline Habitat Complex; 74,000 acres of Marine Sea.
- Alternative 7: 12,000 acres of Saline Habitat Complex; 104,000 acres of Marine Sea
- Alternative 8: 18,000 acres of Saline Habitat Complex; 83,000 acres of Marine Sea.

The particular details of each alternative vary quite substantially, even in terms of where and how the Saline Habitat Complex and Marine Sea will be provided. Yet the common denominator across all of these alternatives is that they are to provide habitat that is intended to (i) restore the long-term stable aquatic and shoreline habitat to historic levels and diversity of fish and wildlife that depend on the Sea, and (ii) protect water quality. Hence, in our analysis below, we do not evaluate and compare neither particular alternatives nor the specific configuration of any alternative. Rather, we compare the intent of these restoration plans—the provision of substitute habitat that at a minimum maintains the services and diversity that have been provided historically—to the outcome under a no-action alternative. We assume that the services at that have been provided at the Sea under the no-action alternative will either cease to exist, or those that still exist will be of substantially lesser quality relative to what has been historically provided (see our discussion in section II.1). Furthermore, we do not consider other elements of the restoration alternative that could be substantial, in particular, issues associated with air quality. Rather, we focus exclusively on the potential benefits of preserving ecosystem services such as those found at the Salton Sea, with particular attention to the values associated with birds, endangered and threatened species, biodiversity, and unique habitats.

Finally, we should note that all of the particular restoration alternatives require substantial construction activities over a number of years, beginning in 2012. The benefits of the services these alternatives are intended to provide may take between 18 and 66 years to come to fruition. Our analysis does not consider adjusting for differing time horizons over which these services will be provided. It should be noted, though, that during the interim period while the construction or these alternatives is occurring, a substitute habitat will be provided to mitigate the adverse impacts of the construction activities as well as any increases in salinity and habitat degradation occurring prior to construction. As noted in the Draft PEIR (2006, pp. 3-6):

> All eight alternatives would include up to 2,000 acres of shallow saline habitat for use by birds after the Salton Sea salinity becomes too high to sustain some species. This habitat would be constructed prior to construction of full-scale habitat components, and is referred to as Early Start Habitat. Early Start Habitat was assumed to be located at elevations between -228 and -232 feet msl. Early Start Habitat would be a temporary feature for two to six years and would be eliminated or assimilated as the alternatives are constructed along the southern shoreline prior to 2020.

Hence, overlooking the time dimension in terms of measuring the benefits these alternatives provide is not critical given the provision of this Early Start Habitat.

III. Non-market Valuation in Benefit-Cost Analysis

Much of the discussion surrounding the restoration of the Salton Sea has centered on the costs of the various alternatives, understandably so given these costs may exceed $4 or $5 billion over the 75 year horizon in which the restoration alternatives are evaluated. The focus on the costs also is likely due, in part, to legislation that mandates such an evaluation. The Secretary of the Resources Agency in California is mandated to establish “suggested criteria for selecting and evaluating alternatives” (Section 2081.7 of the California State Fish and Game Code, part (e)). Two explicitly mentioned criteria include an evaluation of the construction, operation, and maintenance costs of each alternative, and the identification of a cost-effective, technically feasible option. What is surprisingly absent from this discussion is the role the benefits, and in particular the quantification of the benefits, play in the choice of a preferred alternative. While there likely is no disagreement that restoration will cost substantial money, one need only pause briefly to realize that the benefits of restoration can also be substantial and as such, should be considered in concert with any discussion of the costs.

Consideration of the benefits as having equal footing with the costs of such preservation activities is not novel. Ciriacy-Wantrup (1952), Barnett and Morse (1963), and Krutilla (1967) all highlight this point in one way or another in the context of how government might go about considering the trade-offs it requires of its citizenry with respect to natural resource preservation. A major point emphasized by Krutilla, in terms of this trade-off, is to recognize that society benefits from preservation in real terms:

> When the existence of a grand scenic wonder or a unique and fragile ecosystem is involved, its preservation and continued availability are a significant part of the real income of many individuals. (Krutilla 1967; p. 779)

Furthermore, with the loss of similar habitat elsewhere, the value of these assets will likely increase:

> Natural environments will represent irreplaceable assets of appreciating value with the passage of time. (Krutilla 1967; p. 783)

The manner in which one might consider these preservation benefits is in the context of benefit-cost analysis, which we believe provides a more accurate comparison and evaluation of the merits from public spending on Salton Sea restoration than what is currently required of the Resources Agency. While the foundations of benefit-cost analysis can be traced back as far as Benjamin Franklin’s discussion of prudential algebra, the formal use of benefit-cost analysis for large water-related projects can be linked to Eckstein (1958) in his evaluation of federal water-resource programs. In particular, Eckstein (1958, p. 2) references the Flood Control Act of 1936, which suggests that only projects where “the benefits, to whomsoever they may accrue, are in excess of the estimated costs” would be considered. Eckstein described benefit-cost analysis as a very promising approach for evaluating the use of scarce natural and financial capital that can provide a much stronger foundation for policy decisions than what might otherwise be available.

Such insight is certainly useful in the current discussion associated with the Salton Sea. The estimated price tag associated with the eight restoration alternatives range from $2.3 to $5.9 billion in construction costs alone. If decisions were based on just these costs, the no-action alternative would be the economically prudent strategy, costing $801 million.[7] Yet a more economically efficient approach, and one that echoes the sentiments of Eckstein, Franklin, and Krutilla, among others, is to consider the returns for the investment and choose the strategy that provides the greatest returns per dollar invested. The policy that maximizes the difference between total benefits and total costs, i.e., *net benefits*, is considered the most economically efficient solution.

Why there has not been greater focus on using benefit-cost analysis in the context of Salton Sea restoration is puzzling, especially when such an approach has been prominent for more than 30 years at federal level in consideration of major environmental, health, and safety regulations (Morgenstern 1997). Under President Reagan's Executive Order 12291, for instance, all major health, safety, and environmental regulations were subject to a regulatory impact assessment and needed subsequent approval by the Office of Management and Budget (OMB). OMB required the "potential benefits outweigh the costs" and that "of all the alternative approaches to the given regulatory objective, the proposed action will maximize net benefits to society." These requirements were amended slightly under Executive Order 12866 during the Clinton administration. EO 12866 replaced the condition "benefits outweigh costs" with "a reasoned determination that the benefits of the intended regulation justify its costs." Agencies were now allowed to "include both quantifiable measures and qualitative measures of costs and benefits" and to "select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts, and equity)." Clinton's order endorsed benefit-cost analysis as a tool to help inform the regulatory process, without forcing it to adhere to any rigid decision-making formula.

Numerous real world examples exist of governments incorporating the benefits of preserving natural and environmental resources into their decision-making, both in the U.S. and abroad. Such evaluations cover a wide array of resources, including the Glen Canyon Dam (Bishop et al. 1989), Hell's Canyon (Krutilla and Fischer 1975), Mono Lake (Loomis 1987), the spotted owl in the Pacific Northwest (Hagen et al. 1992), Kootenai Falls in Montana (Duffield 1982), and the Kakadu Conservation Reserve in Australia (Imber et al. 1991), to name a few. In these and other studies, the preservation benefits associated with the environmental and natural resources were quantified and given standing in benefit-cost analysis. In each case, the quantification of the preservation benefits either supported an action for preservation, or modified an existing development scheme to be more environmentally friendly. A large part of the value of preservation, if not the largest component economically, is that value that is not traded in markets, i.e., its non-market value.

III.1 Non-market Environmental and Natural Resource Values

For most goods and services, the starting point for estimating value is the market price. Yet for many environmental and natural resource goods and services, no such market price exists. For

[7] Construction costs for the no-action alternatives include pre-existing regulations and mandates requiring protection of the desert pupfish, air quality management, and modification of the recreational facilities at the Salton Sea.

such goods as cleaner air, biodiversity, endangered species, and wildlife habitat, rarely are there market transactions revealing the price, and subsequently the value, of these goods and services to society. Consequently, the scarcity value of these goods and services is not readily apparent to policy makers in charge of determining how these scarce and often unique resources are to be allocated. As an example of this problem, consider the decision of how to allocate an acre of land in, say, Sequoia National Forest. There is value associated with the timber that could be obtained from these giant trees. Yet, there also is value in preserving the forest in its present state for recreation activities such as hiking, camping, and photography today and in the future. There is value indirectly in the habitat these forests and trees provide for other wildlife resources we enjoy. There is also value in simply knowing that these resources exist for use by others, and possible future use by current and future generations. As such, we define the value of a resource that is not revealed through market transactions as its non-market value. Without knowledge these non-market values, benefit-cost analysis is limited in its usefulness in aiding policy markers on how to efficiently and equitably allocate these resources.

The objective of non-market valuation is to estimate the economic value of these environmental and natural resources to society. Quantification of the benefits allows these goods and services to have equal footing in benefit-cost analysis. In considering the benefits of preservation, one would want to account for total value of the resource, where total value is defined as:

Total Economic Value = Use Value + Non-use Value.

Use value relates to the tangible use of the resource presently. It can include both consumptive use (e.g., *catch and keep* fishing) and non-consumptive use (e.g., photography, or *catch and release* fishing). Non-use value, as described in Kopp and Smith (1993; p. 340), is that "…component of the value of a natural resource that does not derive from the in situ consumption of the resource." Alternatively, Freeman (2003) notes that environmental values that are independent of peoples' current use have been given a variety of names, including non-use value, existence value, intrinsic value, and passive-use value. There are four general categories for non-use values, including: *option value*—the value that people place on a good or service for future possible use; *altruistic value*—the value someone places on the preservation of a resource for use by others in the current generation; *bequest value*—the value someone places on the preservation of a resource for use by future generations; and *existence value*—the value one places on a resource for its mere existence, possibly for moral or ethical reasons.

Non-market valuation techniques are widely accepted and used by federal and state agencies, including the National Marine Fisheries Service, the U.S. Water Resources Council, and state fish and game agencies in such states as Oregon, Nevada, California, Idaho, and Maine, to name a few (Loomis 1993).[8] And while the popular press has only recently begun extolling the importance of placing a value on non-market environmental goods and services,[9] these values, and the techniques used to estimate them, have been given standing in legislative mandates and by state and federal government agencies for decades, including: the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA) of 1980; the Oil

[8] For a complete description of these techniques, see Freeman (2003).

[9] For example, The Economist, 2005, April 3rd- 29th, pp. 76-78; Business Week, 2004, December 29th; Infocus Magazine, 2005; 4.3; Outside Magazine, March, 2005, pp. 106-123.

Pollution Act (OPA) of 1990; U.S. Water Resources Council; the U.S. Department of Interior (DOI); and the U.S. Forest Service. Federal and state agencies also consider non-market values when making natural resource allocation decisions. Since 1979, for example, the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation have been required to assess the value of recreation benefits in cases where federal projects impact areas of high visitation (U.S. Water Resources Council 1979; Loomis 2005). The U.S. Environmental Protection Agency is required to conduct benefit-cost analyses of environmental regulations and must include estimates of non-market benefits. CERCLA mandates that lost recreation values and "passive use" values from toxic waste sites and hazardous materials spills must be assessed in order to measure the full value of damaged natural resources. Many states have funded studies measuring non-market values associated with recreation, including the State of California, which sponsored an analysis of the values of protecting Mono Lake as a bird habitat (Loomis 2005). The validity of valuing changes in natural resource quality has been upheld in state and federal courts, and these techniques have been useful in guiding resource allocation decisions at state and federal levels.

In considering the non-market values associated with preservation of the Salton Sea, a variety of stakeholders come to mind. The Sea provides many non-market benefits to the State of California. As mentioned in Section II, thousands of visitors frequent the Sea annually for birdwatching, it has been the only Talapia sports fishing area in the state, and other activities such as camping, boating, and swimming occur throughout the year. Indeed, on average nearly 200,000 visitors annually frequent the Salton Sea State Recreation Area alone. According to IEEC (1998), the total value in 1998 of all Salton Sea properties within ½ mile of the shoreline was $154.8 million, while the total population within five miles of the Salton Sea was estimated to be fewer than 15,000. Maintaining and/or enhancing recreational uses can impact a large population base, including residents from San Diego and Los Angeles, California.

The Sea also provides non-market benefits to the nation as a whole. The Salton Sea is ranked as the second highest birding area in the nation. Indeed, 90% of the North American population of eared grebes, more than 80 percent of the entire western U.S. population of white pelicans, and nearly half of the U.S. population of Yuma clapper rails (an endangered subspecies) utilize this habitat. The Sea is also one of the two nesting areas in the western US for gull-billed terns, a bird proposed for listing as a threatened species. From a fishery perspective, the Sea has supported eight species of fish, including the federally endangered desert pupfish and four important sport fishes (Tilapia, Bairdiella, Sargo, and Orangemouth Corvina).

While citizens throughout the U.S. are likely to have positive use and non-use values for preserving ecosystem services at the Salton Sea, geographic proximity likely plays some role in influencing the magnitude of these values. While there is an obvious connection between use value and proximity, particular types of non-use values (e.g., option value, altruistic value, and bequest value) are likely to be influenced by proximity as well. From a regional or national perspective, then, other states along the Pacific Flyway—Washington, Oregon, and Arizona—are likely to have fairly high non-market values for Salton Sea preservation. Furthermore, given that Nevada is contiguous with California and has a major metropolitan center less than a one-day drive from the Salton Sea, they too likely have large non-market values for Sea preservation.

III.2 The Contingent Valuation Method and Non-use Values

Much, if not most, of the value and benefits of preserving the Salton Sea likely is represented by non-market values, and in particular, the non-use value component of total value. In the studies presented below from which we identify possible values associated with Salton Sea restoration, the Contingent Valuation Method (CVM) is often used. CVM is one of the most popular methods for estimating non-market values, and the most popular method for estimating non-use values as it is one of two methods that estimate these values.[10] As a stated preference method, CVM uses a survey to create a realistic, albeit hypothetical, market where peoples' values for a good or service are expressed. CVM is well-suited for estimating the preservation value associated with the Salton Sea as it allows estimation of total value of any particular good or service, or habitat, rather than components of that value. CVM is a well-accepted technique for valuing non-market goods and services, with there being far greater than 1600 CVM studies estimating non-market values in over 40 countries (Carson et al. 1994). The U.S. DOI has adopted CVM to measure non-market values for damages under CERCLA, while NOAA has endorsed the use of this method for damage assessment under the Oil Pollution Act of 1990; it is also recommended by the U.S. Water Resources Council (1979) for use in benefit-cost analysis.

CVM surveys consist of four main elements. The first element is a description of the program the respondent is asked to value or vote upon. This element often involves a description of the baseline services with no action, and an improved level of services with some type of policy action. Identifying the conditions of the "no-action" alternative and other restoration options will require research by the physical and biological scientists on this team. The second element of the CVM is specifying a mechanism for eliciting value or choice. There are a variety of options for eliciting value, the most well-accepted being a referendum type question that asks the respondent to vote yes or no to a specified price or prices. A "payment vehicle" describing the manner in which the hypothetical payments are collected is the third element. Such vehicles have included higher taxes or utility bills, or a payment into a trust fund (Loomis et al. 2000). The fourth element consists of collecting information on respondent attitudes and characteristics including socioeconomic characteristics and environmental attitudes.

It should be mentioned that the measurement of non-use values, and in particular using CVM to measure non-use values, has generated controversy. In theory most economists seem to agree that non-use values are indeed a legitimate value; in practice, though, there is concern as to the reliability of such estimates since non-use values entail no actual observable use (Hausman 1993). In an effort to assess the reliability of CVM in measuring non-use values, NOAA convened a panel of prominent social scientists co-chaired by two Nobel Laureate economists. The panel concluded that if CVM practitioners follow a certain set of conditions, the results obtained from CVM are likely to be reliable (Arrow et al. 1993) and a useful starting point for administrative and judicial decisions. Subsequent research has discussed issues associated with the conclusions of the NOAA panel, and provided additional procedures that ensure CVM reliability (Hanemann 1994). There is precedent at the federal levels for acknowledging and incorporating non-use values into economic analysis. The U.S. DOI under CERCLA, and NOAA under the Oil Pollution Act of 1990, both endorse including non-use values in their economic analyses associated with measuring the loss in value from chemical and oil spills.

[10] For a complete description of this method, see Freeman (2003).

IV. Case Studies of Non-Market Benefits Estimates for Ecosystem Services

The most accurate and reliable assessment of the non-market benefits provided by the ecosystem services of the Salton Sea would require a primary valuation study. Such a study would involve a detailed survey of a sample of the population of individuals who potentially benefit from the ecosystem services of the Sea. This sample would include both users of the Sea (e.g., birders, anglers, hunters) as well as people who have not used the Sea and who may not even plan to use it, but who nonetheless derive benefits from the flow of ecosystem services in the form of non-use value. The survey data would form the basis for a statistical analysis of individual values, which would then be extrapolated from the survey sample to the relevant population to determine the aggregate benefit provided to the public by the ecosystem services of the Sea.

Currently it is not possible to conduct a primary valuation study for the Salton Sea because both time and funding are insufficient. But it is possible to examine the results of previous studies of similar resources in order to gain a better understanding of the likely magnitudes of non-market benefits derived from the Sea. The use of information from previous primary valuation studies to inform current decisions is known as "benefit transfer" (Rosenberger and Loomis 2003).

Generally the initial steps in any benefit transfer involve: (1) defining the policy context; (2) conducting a thorough literature review; and (3) screening and evaluating the previous research studies. Subsequently, various statistical tools can be brought to bear on the estimates derived in the previous studies in order to "transfer" the information to the case at hand. Relatively simple applications involve calculating an average per-unit value from the previous studies and using that quantity to approximate the per-unit value in the current application. This is often called "value transfer." More complex analyses involve using the previous studies to estimate a "benefit function" that accepts as inputs the characteristics of a resource and provides as output a value estimate. This is often called "function transfer" (for an example involving wetlands, see Brander et al. 2006).

The purpose of this report is to accomplish steps (1) – (3) and then to provide some preliminary estimates using the value transfer method that suggest the likely magnitude of non-market benefits provided by the Salton Sea. These estimates are preliminary because we are unable to undertake a formal statistical analysis of the previous research studies at this time. However, our approach conforms to accepted benefit transfer practices.

IV.1 Research Methodology and Literature Search Strategy

To identify previous valuation studies with potential relevance for the Salton Sea, we undertook a thorough search of the environmental and natural resource economics literature on ecosystem service valuation. We focused on the types of services that tend to benefit geographically dispersed populations, rather than just the local population residing in the immediate vicinity of the resource.[11] Our search included: (1) the EconLit database, which is the American Economic

[11] It is worth emphasizing that the purpose of this report is not to focus on the types of values the Sea provides to its local resident population, but rather the types of values it provides to a much broader set of individuals residing in California, throughout the U.S., and perhaps even in other countries.

Association's electronic bibliography and the main repository for academic research in all economics disciplines, including over 782,000 records; (2) the Environmental Valuation Reference Inventory (EVRI), which is maintained by Environment Canada and includes over 1,700 economic valuation studies; (3) Google Scholar, which provides access to potentially relevant papers published in disciplines other than economics that may not be included in the preceding databases; and (4) our own private collections of literature on natural resource valuation. We searched for studies that addressed combinations of the following topics: existence, option, preservation, bequest, altruistic, passive use, or non-use value; birds, fish, endangered, or threatened species; ecosystem, wetland, flyway, habitat, or biodiversity; waterfowl hunting; Mono Lake, San Joaquin Valley, Owens Lake, Great Salt Lake, Aral Sea, or San Diego National Wildlife Refuge; or contingent valuation.

IV.2 Results and Interpretation

Our initial searching and screening of these sources and topics produced around 70 studies. Our secondary screening narrowed the list to 23 studies of which 20 included at least one value with potential relevance for the Salton Sea. These 23 studies are summarized in table 1. They also are grouped according to topical similarity: San Joaquin Valley (7 studies), Mono Lake (3 studies), endangered species (5 studies), waterfowl hunting (3 studies), and other (5 studies).

Table 1 is organized as follows. The first column provides the bibliographic source. We were able to locate copies of 21 of the 23 studies; for the remaining 2 studies we relied on summaries provided by EVRI. The second column summarizes the most relevant valuation information from each study: typically the resource(s) that was (were) valued, the relevant population, and the reported value estimate(s). In this column we also translate reported values to current values by adjusting each reported estimate to 2006 dollars using the U.S. Bureau of Labor Statistics' Consumer Price Index (U.S. Department of Labor 2006). The third column identifies the relevance of each study for the Salton Sea and the fourth column provides additional comments.

IV.2.a San Joaquin Valley Studies

Before it was intensively developed for agricultural and urban uses, the San Joaquin Valley (SJV) provided habitat for between 5 and 10 million resident and migratory waterfowl and 100,000 spawning Chinook salmon annually (Jones & Stokes Associates (JSA) 1990). By the mid 1980s, the bird population had declined to nearly 500,000, the salmon population had declined to approximately 30,000, and about 90% of all wetlands in the SJV had been lost (JSA 1990). As part of an effort to address the problem of agricultural drainage in the SJV and its impacts on natural resources, a contingent valuation study was conducted by Jones & Stokes Associates, Inc. (JSA 1990) to estimate the economic values associated with alternative fish and wildlife programs. Here we review this study (the JSA-SJV study) and the analyses it spawned.

The JSA-SJV study surveyed selected households in California (both within and outside of the SJV), Oregon, Washington, and Nevada in order to determine estimates of both use and non-use values. By focusing on these states, the study captured values held by residents in the heart of the Pacific Flyway, of which the SJV is an important part. Clearly residents in other states and countries may also benefit from the ecosystem services of the SJV, but this study focused on the region where individual values arguably could be highest. The values estimated by the study later were used to determine the economic efficiency of transferring water from existing uses, such as agriculture, to wetlands and the San Joaquin River.

The JSA-SJV study focused on five possible environmental programs and asked respondents to state whether they would vote for each program if it would cost their household some additional amount in taxes each year. The programs were (JSA 1990):

- Wetlands habitat and wildlife maintenance program. Prevents a 70% decline in high-quality wetlands habitat (from 85,000 to 27,000 acres); prevents an 85% decline in resident bird populations and a 65% decline in migratory bird populations; maintains other threatened and endangered species in the SJV at their current population levels.
- Wetlands habitat and wildlife improvement program. Increases high-quality wetlands habitat by 45% (from 85,000 to 125,000 acres); increases resident bird populations by 40% and migratory bird populations by 45%; increases populations of other threatened and endangered species in the SJV by about 50%.
- Wildlife contamination control maintenance program. Prevents an increase (from 70% to 95%) in the percentage of the SJV's resident bird population that is regularly exposed to harmful levels of contamination.
- Wildlife contamination control improvement program. Reduces (from 70% to 20%) the percentage of the SJV's resident bird population that is regularly exposed to harmful levels of contamination.
- San Joaquin River and Salmon improvement program. Increases annual number of spawning Chinook salmon from less than 100 to 15,000; increases commercial salmon catch by about 6% and recreational catch by about 5%; improves habitat for resident and migratory bird populations; improves wildlife viewing opportunities and scenic quality; improves opportunities for water-based recreation (rafting, canoeing, kayaking).

The data collected by the JSA-SJV study was used by six of the seven *San Joaquin Valley* studies listed in table 1. The six studies differ in terms of their statistical methods, their relevant populations (some use all respondents, one uses only California residents, one uses only SJV residents, one uses non-SJV California residents), and their main foci (one focuses on distance, another on substitution effects across the five programs). The seventh study in this section uses a different data set—a survey of visitors to SJV wetlands—to estimate use value.

The relevance of these studies for the Salton Sea is clear. Each assesses use and/or non-use values held by western U.S. residents for maintaining or improving ecosystem services in the California section of the Pacific Flyway. Each focuses on wetlands habitat and bird populations. Several demonstrate significant value held by residents who do not reside in the immediate vicinity of the resource. All of these characteristics are applicable to the case of the Salton Sea.

San Joaquin Valley Studies: Values

Using the information summarized in table 1, we can generate a range of estimates for the current annual value of 1,000 acres of SJV wetlands to an average household (in 2006 dollars):[12]

For the average household in CA:
- Annual value of 1,000 acres of SJV wetlands saved: $4.31
- Annual value of 1,000 acres of SJV wetlands created: $6.15-$10.33

For the average household in OR, WA, and NV:
- Annual value of 1,000 acres of SJV wetlands saved: $2.59
- Annual value of 1,000 acres of SJV wetlands created: $4.18-$6.55

For the average household in CA, OR, WA, and NV:
- Annual value of 1,000 acres of SJV wetlands saved: $4.26
- Annual value of 1,000 acres of SJV wetlands created: $10.20

Extrapolating the per-household values to the number of households reported in the 2000 census (U.S. Department of Commerce 2001), which is a conservative estimate of the current number of households, gives (in 2006 dollars):

For all households in CA:
- Annual value of 1,000 acres of SJV wetlands saved: $49.6 million
- Annual value of 1,000 acres of SJV wetlands created: $70.7-$118.9 million

For all households in OR, WA, and NV:
- Annual value of 1,000 acres of SJV wetlands saved: $11.3 million
- Annual value of 1,000 acres of SJV wetlands created: $18.2-$28.5 million

For all households in CA, OR, WA, and NV:
- Annual value of 1,000 acres of SJV wetlands saved: $67.6 million
- Annual value of 1,000 acres of SJV wetlands created: $161.8 million

Using the lowest estimates, the current annual value of 1,000 acres of SJV wetlands is:

- $49.6 million to all households in CA
- $11.3 million to all households in OR, WA, and NV
- $67.6 million to all households in CA, OR, WA, and NV

San Joaquin Valley Studies: Summary

To the extent wetlands at the Salton Sea provide ecosystem services similar to those provided by wetlands in the SJV, and to the extent people value these services similarly, a conservative

12 This analysis assumes a constant per-acre value and does not consider statistical confidence intervals that may have been reported in the original studies.

estimate of the current state-wide annual value of 1,000 acres of wetland habitat at the Salton Sea is approximately $50 million. Applying this estimate to each of the eight restoration alternatives implies the following state-wide annual values:

- Alternative 1: $1.9 billion for 38,000 acres of Saline Habitat Complex.
- Alternative 2: $3.75 billion for 75,000 acres of Saline Habitat Complex.
- Alternative 3: Unknown value for 61,000 acres of Marine Sea.
- Alternative 4: $4.4 billion for 88,000 acres of Concentric Lakes that would serve a similar role as the Saline Habitat Complex.
- Alternative 5: $2.275 billion for 45,500 acres of Saline Habitat Complex; unknown value for 62,000 acres of Marine Sea.
- Alternative 6: $1.45 billion for 29,000 acres of Saline Habitat Complex; unknown value for 74,000 acres of Marine Sea.
- Alternative 7: $0.6 billion for 12,000 acres of Saline Habitat Complex; unknown value for 104,000 acres of Marine Sea
- Alternative 8: $0.9 billion for 18,000 acres of Saline Habitat Complex; unknown value for 83,000 acres of Marine Sea.

Assuming any of these alternatives would adequately restore the ecosystem services provided by the Sea and prevent future degradation, Alternative 7 suggests that the state-wide value of preserving the Sea is at least $0.6 billion annually and probably significantly higher due to the unknown value associated with the large Marine Sea. Alternatives 1, 2, and 4 suggest the state-wide value is between $1.9 and $4.4 billion annually. We believe the latter range is more indicative of the actual value.

However, caution should be used in transferring any of the estimated SJV values directly to the Salton Sea. Despite their many similarities, the Salton Sea and the SJV are different places marked by different characteristics. People's perceptions of them may differ and therefore their values may differ. The JSA-SJV study also was conducted 17 years ago when the population of the western U.S. was different than it is today. Although none of these arguments should be interpreted as justification for necessarily discounting the values reported in table 1 (indeed, as wetland habitat along the Pacific Flyway becomes more scarce (Dahl et al. 1997; Friend 2002), its value is likely to rise; furthermore, as people become wealthier, their willingness to pay for preservation efforts tends to increase), they should be interpreted as rationale for treating the value transfer as a *suggestive* estimate. A significantly more accurate estimate could be obtained from a primary valuation study of the Salton Sea.

IV.2.b Mono Lake Studies

Mono Lake is a 760,000 year-old saline lake which historically contained about 4.3 million acre-feet of water with an average depth of around 78 feet and an approximate surface area of 54,700 acres (Mono Lake Committee 2006; JSA 1993). Since 1941, the City of Los Angeles has been using the lake's natural inflow as a water source when it extended the first Los Angeles aqueduct north into the Mono Basin. When the second Los Angeles aqueduct was completed in 1970, the city began diverting its full allocation of 100,000 acre-feet of water each year (Loomis 1987). Due to both water diversions and drought, the lake level fell significantly and the ecosystem—

which provides nesting habitat for substantial portions of the California population of California gulls and the world population of Eared Grebes—became increasingly stressed (Loomis 1987). The scenic quality of the lake and its suitability as a recreational resource also were damaged. A series of court cases eventually established that the State of California must balance its enforcement of the right to divert water against its duty to steward natural resources, and that this balancing may involve modifications to existing water rights when diversion causes unavoidable damages (Loomis 1987).

To help inform the debate regarding the definition of "balance," a contingent valuation study was conducted to determine the public benefits derived from the Mono Lake ecosystem (Loomis 1987). After reviewing this study, the California State Water Resources Control Board (the State Water Board) required an even more thorough non-market valuation study as part of the Environmental Impact Report (EIR) for the Mono Basin Water Rights Review. This study was conducted by Jones & Stokes Associates, Inc. (JSA 1993) and also included a contingent valuation survey. The two contingent valuation studies were similar but the values reported in the EIR (the JSA-Mono Lake study) generally were more conservative.

Both studies surveyed selected households in California in order to estimate both use and non-use values associated with Mono Lake.[13] As in the case of the SJV wetlands, residents in other states and countries may also benefit from the ecosystem services provided by Mono Lake; but these studies again focused on the region where individual values are probably highest. In the Mono Lake case, this region coincided with the political entity charged with balancing the costs and benefits of competing uses. The values estimated by these studies, particularly the JSA-Mono Lake study, were used to assess how much the public should invest in water conservation practices and/or reallocate existing diversions from lower to higher valued uses.

The key issue in the Mono Lake case is the lake elevation, which is directly linked to the scenic quality of the lake, recreation opportunities, water quality, air quality, habitat suitability and food availability for birds, and water supply for Los Angeles. Therefore each of these studies developed alternative lake elevation scenarios to be evaluated by respondents. Each lake elevation corresponded to a set of conditions that were described to respondents who were then asked questions about their preferences for the different scenarios. Loomis also conducted a follow-up study (Loomis 1989) to determine if values had changed through time.

Mono Lake Studies: Values

In 1994 the State Water Board established a target lake elevation of 6,392 feet. Although this level is about 25 feet below pre-1941 levels, the Board determined that this level would adequately restore the ecosystem services and prevent future degradation. Using the information summarized in table 1, we can generate a range of estimates for the current annual value of maintaining an "ecologically adequate" lake level, as defined by the State (in 2006 dollars):[14]

For the average household in CA:

[13] The JSA-Mono Lake study also conducted a separate regional assessment of recreation benefits, but the recreation benefits that are specific to Mono Lake also are included in the contingent valuation estimates.

[14] Again we do not consider statistical confidence intervals that may have been reported in the original studies.

- Annual value of maintaining a 6,387-foot elevation (Loomis 1987): $288-$656
- Annual value of maintaining a 6,387-foot elevation (Loomis 1989): $199-$252
- Annual value of maintaining a 6,390-foot elevation (JSA 1993): $131

It is important to note that these values are relative to a "no-action" scenario that was specified in each study. That is, these values represent average household willingness to pay to achieve the specified lake level *rather* than allow the lake level to decline to the no-action level. As table 1 shows, the no-action level specified by Loomis (6,342 feet) was much lower than the no-action level specified in the EIR (6,372 feet). We suspect the relatively higher values derived by Loomis were largely due to this difference: with more at stake, people were willing to pay more.

Extrapolating these per-household values to the number of households reported in the 2000 census (U.S. Department of Commerce 2001), which is a conservative estimate of the current number of households, gives (in 2006 dollars):

For all households in CA:

- Annual value of maintaining a 6,387-foot elevation (Loomis 1987): $3.3-$7.5 billion
- Annual value of maintaining a 6,387-foot elevation (Loomis 1989): $2.3-$2.9 billion
- Annual value of maintaining a 6,390-foot elevation (JSA 1993): $1.5 billion

Mono Lake Studies: Summary

To the extent the ecosystem services provided by a restored Mono Lake and a restored Salton Sea to the residents of California are similar, and to the extent people value these services similarly, a conservative estimate of the current state-wide value of adequate restoration and preservation of the Salton Sea is approximately $1.5 billion annually.

However, as before, caution should be used in transferring any of these values directly to the Salton Sea. Although Mono Lake and the Salton Sea exhibit many of the same important characteristics, they also exhibit important differences that have not been quantified here. People's perceptions of these resources also may differ and therefore their values may differ. Both the Loomis study and the JSA-Mono Lake study were conducted 15-20 years ago when the population of California was different than it is today. Again, these arguments should not be interpreted as justification for discounting or inflating the values in table 1, but they should be interpreted as strong motivation for treating the value transfers as *suggestive* estimates. A significantly more reliable estimate could be obtained from a primary valuation study of the Salton Sea.

IV.2.c Endangered Species Studies

Table 1 presents five studies of endangered species preservation. Four of these studies are primary valuation studies and one is a meta-analysis of previous work. The species examined by the four primary valuation studies include: the Riverside fairy shrimp, the whooping crane, the Mexican spotted owl, and the striped shiner. Although the relevance of each study for the Salton Sea is provided in the table, both individually and as a whole the values estimated by these studies are not as informative or as transferable as those for the SJV and Mono Lake. Generally this is because the SJV and Mono Lake studies focus on whole ecological systems that provide a myriad of benefits to the public, whereas these studies focus on the value of preserving individual species.[15] The SJV and Mono Lake studies therefore provide more reliable assessments of the total non-market value associated with a resource like the Salton Sea. Our discussion of the endangered species studies, therefore, is more limited.

As a group, these studies generally demonstrate significant non-use value held by U.S. residents (or subsets thereof) for preserving endangered bird and fish species. Two of these species—the Riverside fairy shrimp, which is native to Southern California, and the striped shiner—could be characterized as obscure or uncharismatic but potentially important components of the food web. This is particularly true for the fairy shrimp which is an important food source for migratory birds (Stanley 2005). Similarities with the Salton Sea are evident.

It is important to note that it would not be appropriate to simply add the value of species preservation to an estimate of ecosystem value similar to those presented above because doing so likely would involve double-counting certain benefits. However, it is reasonable to expect that people place higher values on ecosystem preservation efforts when an endangered species is involved *ceteris paribus*.[16] The presence of multiple threatened and endangered species at the Salton Sea, including the Yuma clapper rail and the brown pelican, thus would tend to increase preservation values.

Lastly, it is also worth noting that Stanley (2005) argues for national support of species preservation efforts because the benefits of such efforts tend to be geographically wide-spread. A primary valuation study of the Salton Sea that includes residents from throughout the western U.S. likely would capture a significant portion of this dispersed value.

IV.2.d Waterfowl Hunting Studies

Upon first consideration, the benefits provided by the Salton Sea to waterfowl hunters might seem to comprise a relatively small portion of its total non-market value. This would seem to be especially true if one considers only hunting trips taken to the Sea itself. But the Sea is an important component of the Pacific Flyway. The characteristics of the Sea help to determine the types and numbers of birds using the Flyway and thus affect the quantity and quality of hunting trips taken throughout the Flyway. In other words, just as preservation efforts at the Sea provide non-use value for residents who live far away and may never visit the Sea, such efforts also provide use value for hunters who also never visit the Sea but who hunt elsewhere in the Flyway.

According to the U.S. Fish and Wildlife Service, nearly 2.5 million hunting trips were taken for migratory birds in the Pacific Flyway states of CA, OR, WA, and NV during 2001 (U.S. Department of the Interior 2001). Using the most conservative estimate of the <u>net</u> benefit of a

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[15] Preservation of a species typically involves preservation of its habitat which likely generates other benefits. However, the contingent market that must be created to assess the value of preserving a species tends to be different from the market created to assess the value of preserving habitat that contains a species; therefore the estimated values tend to be different.

[16] We are unable to find statistical evidence that supports this reasoning.

trip from table 1 ($47), the current annual net value of hunting migratory birds in these states is approximately $115 million.[17]

The portion of this net value that can be attributed to the ecosystem services provided by the Salton Sea is unclear. It has been shown that hunters value more bird sightings (Duffield and Neher 1991), so to the extent the Salton Sea ecosystem supports the migratory bird population of the Flyway, it adds to the value of each trip currently taken (and thus to the total value of hunting). Higher bird numbers may also encourage more trips to be taken, which also would increase the total value of hunting in the Flyway.[18] Furthermore, as the total amount of habitat in the Pacific Flyway decreases, each remaining refuge plays an increasingly important role in sustaining the bird population. Less habitat generally means less food, fewer nesting sites, and increased risk of disease due to the effects of concentrating the population in relatively few areas.

As before, it is important to note that it would not be appropriate to add the value of hunting in the Flyway to an estimate of ecosystem value because doing so likely would involve double-counting certain benefits. Rather, we highlight this use value to emphasize that both use and non-use values provided by the Sea are probably both large in magnitude and geographically widespread. A contingent valuation study that includes residents throughout the Pacific Flyway could capture this aspect of preservation value.

IV.2.e Other Studies

The remaining five studies in table 1 cover a range of subjects, each related to the Salton Sea. Three are primary valuation studies of Pacific coast seabirds, migratory birds in the Central Flyway, and wetlands in the northeastern U.S. One is a meta-analysis of wetland valuation studies. Notably, the study by Loomis (2000) emphasizes the diffuse nature of benefits derived from resource preservation programs. For six different programs, the study estimates the fraction of total national value that is held by residents within the state(s) where the resource is located. The study finds that, on average, state residents hold only 13% of the total value, with the remaining benefits accruing to out-of-state residents. For California, the fraction is slightly higher at 18%, and it is not possible to rule-out percentages as high as 100% for two of the three California programs considered. Nonetheless, these results reinforce the argument by Stanley (2005) that national support for preservation efforts typically can be justified on the basis of geographically wide-spread benefits. This is likely to be true especially for large-scale efforts.

IV.3 Summary of Results

Our review of the relevant literature produced 23 studies of which 20 contain at least one value which is potentially relevant for the Salton Sea. Of these studies, those which address wetlands and wildlife in the San Joaquin Valley and those which address the Mono Lake ecosystem are

[17] Net benefit (or net value) is the difference between the gross benefit derived and the cost incurred. All other values reported in this report are gross benefits, which can be measured as willingness to pay (WTP). Using the estimated (gross) benefit of a hunting trip in the Montana section of the Pacific Flyway from table 1 ($140) yields a current annual value of $342 million for hunting in these four Flyway states.

[18] Duffield and Neher (1991) examined this possibility but did not find a statistically significant effect. We are unable to find statistical evidence that supports this reasoning.

most relevant and provide the most useful benefits estimates. Keeping in mind the uniqueness of the Salton Sea—which we believe tends to increase its value while also making it difficult to transfer benefits estimates from previous research—and the caveats we have provided throughout this report, we believe that a conservative order-of-magnitude estimate of the non-market benefits provided to the residents of California by a restored and preserved Salton Sea would be in the range of $1-$5 billion annually. This is an annual value expressed in 2006 dollars. It is largely based on the $1.9-$4.4 billion benefit estimate calculated from the SJV studies and on the $1.5 billion benefit estimate calculated from the Mono Lake studies. This estimated range includes both use and non-use value, but probably mostly non-use value.

When considering whether to invest in a project that will generate returns for many years into the future, economists regularly convert all future payments into present values to determine whether the investment is expected to produce a positive net return. By specifying a discount rate and a time horizon, and making the conservative assumption that the nominal annual benefit derived from the Sea remains constant through time, we can convert our estimated range of annual benefits into a present value so that it may be more readily compared with anticipated costs. Table 2 provides the present value of $1 billion annually for different discount rates and time horizons. Multiplying each table entry by 5 gives the present value of $5 billion annually for the same combinations of discount rates and time horizons.

Some additional considerations are worth mentioning when interpreting this estimated range of preservation benefits. First, assuming the transferability of the SJV and Mono Lake estimates is high (something we cannot determine with certainty without conducting a similar primary valuation study of the Salton Sea), we are inclined to believe that they probably underestimate the total non-market value of the Sea. We believe the SJV estimates are low primarily because they value only wetland habitat. The other attributes of the Sea clearly have positive values that are not included in this estimate. We believe the Mono Lake estimate is low primarily because the Sea is significantly larger than Mono Lake and seems to provide a wider variety of services to society. Furthermore, we believe the higher Mono Lake estimates by Loomis (1987, 1989) may provide better comparison values for the Sea because they are based on a relatively worse no-action scenario. Compared to the no-action scenario considered in the Mono Lake EIR (JSA 1993), we think the no-action scenario considered by Loomis is more similar to that for the Salton Sea.[19]

However, people's perceptions of the Sea could differ significantly from their perceptions of the SJV wetlands and Mono Lake, and this could lead to lower values being associated with the Sea. Mono Lake, in particular, is a very unique resource with a relatively high degree of scenic quality. We would not be surprised if western U.S. residents generally are more aware of Mono Lake than they are of the Sea, and this, too, could affect aggregate values. There also may be a perception that the SJV wetlands and Mono Lake are more "natural" resources deserving of preservation whereas the current Sea was formed (and continues to be sustained) by human manipulation of the environment. We are not passing judgment on such perceptions; rather we simply are highlighting their role in value determination.

[19] It is also worth noting that the time horizon considered in Loomis' no-action scenario—30 years—is very similar to the expected amount of time it would take the Sea to transition in the absence of a restoration effort.

On the other hand, the Sea is linked to a much larger local economy than is Mono Lake, and it is arguably a much more important part of this economy than are wetlands to the SJV economy. Furthermore, this economy exhibits a high degree of poverty and health problems (Cohen and Hyun 2006) relative to the state-wide averages in California. To the extent people are willing to pay to achieve a more equitable distribution of wealth and well-being in society, this would tend to increase the values derived from preserving the Salton Sea.

Lastly, it is worth noting that the Draft Environmental Assessment and Land Protection Plan for the South San Diego Bay Unit of the San Diego National Wildlife Refuge states, "… values on the order of $10 to $100 per household per year [are] representative of the value California households place on the protection of resources such as South San Diego Bay." (U.S. Department of the Interior 1998, p.75) This range refers to non-use values and was used in the socioeconomic analysis for the Refuge, which also provides habitat in the Pacific Flyway and is in relatively close proximity to the Salton Sea. However, the total amount of protected area being considered at the time was, at most, only 5,000 acres. Converting this range of household values to 2006 dollars, aggregating across all California households (again using the 2000 census figures), and rescaling to 1,000 acres gives a total value in the range of $28 million to $280 million annually. Although we place relatively less faith in the accuracy of this estimate, it nonetheless appears to be consistent with our preceding estimate of $50 million for 1,000 acres.

V. Conclusions

The Salton Sea is a unique, biological diversity habitat that supports an abundance of wildlife. From an avian perspective, and quoting Shuford et al. (2002):

> Various studies indicate the Salton Sea is of regional or national importance to various species groups—pelicans and cormorants, wading birds, waterfowl, shorebirds, gulls and terns—and to particular species—the Eared Grebe, American White Pelican, Double-crested Cormorant, Cattle Egret, White-faced Ibis, Yuma Clapper Rail, Snowy Plover, Mountain Plover, Gull-billed Tern, Caspian Tern, Black Tern, and Black Skimmer.

As Cohen and Hyun (2006) note, in addition over 402 bird species having been recorded in and around the Salton Sea, the Sea provides habitat to two species listed on the Federal Endangered Species List—the Yuma Clapper Rail and the Brown Pelican—and is possibly the most critical wintering habitat for eared Grebes worldwide. Through its role in providing food (e.g., fish), as a roosting or nesting site, or as a stopover or wintering habitat for migratory birds along the Pacific Flyway, Salton Sea provides services to society at the local, state, regional, national, and international levels.

Unfortunately, without substantial human intervention, the Salton Sea will cease to provide such an impressive array of critical, unique, and abundant services. Rising salinity levels, continual inflows of pollution from agricultural drainage and wastewater flows, and a water transfer scheme that threatens to exacerbate salinity rise and inflow reductions will damage and degrade this habitat for roosting and breeding, and eliminate the food source (fish) for many of the bird species. The outcome of this trend in habitat degradation and loss could be significant, for both the Salton Sea in its ability to serve its historic function as a habitat for both birds and fish, and for the existence and health of particular bird and fish populations themselves.

The objective of this report is to provide an approximate value for what society might gain from restoring and preserving the Salton Sea using a simple benefits transfer approach. While time constraints restricted our ability to perform a specific and complete valuation study of the restoration alternatives for the Salton Sea relative to a baseline with no-action, or to analyze statistically the results from previous studies in a meta-analysis, we were able to obtain valuation estimates from previous studies that did perform such analyses of unique habitats, ecosystems, or endangered and threatened species. Based on the estimated values from a variety of ecosystem or species valuation studies, and assuming the Salton Sea provides similar services or provides habitat to similarly valued individual and threatened species as investigated in these other studies, restoration and preservation of the Salton Sea may be worth between $1 and $5 billion annually to California residents.

Caution is warranted regarding the interpretation of these estimates because they are based on previous studies involving different natural characteristics, different populations, and at different time periods. Yet, *ceteris paribus*, economic theory suggests that loss of substitute habitat, increasing populations in California, the western U.S., and the U.S. as a whole, and increasing real income levels would all put upward pressure on these preservation values. To echo Krutilla (1967) again, these unique natural resources are assets of appreciating value that provide a significant part of the real income of many individuals. Furthermore, most of the studies we analyze are specific to a state or region rather than national in scope. Based on the results of Loomis (2000) who evaluates six different resource preservation programs, residents within the states where each resource is located hold only a fraction of the total national value. Furthermore, as estimated in Loomis and White (1996) through their meta-analysis of valuation studies for rare, threatened, and endangered species, the authors find that even for the most costly endangered species preservation efforts, the benefits are likely to exceed the costs. With these factors in mind, there are many reasons to believe that the estimates developed here are conservative estimates of the national values associated with Salton Sea restoration/preservation.

In conclusion, while the costs of restoring the Salton Sea has been touted as exorbitant, with estimates exceeding $4 or $5 billion, when one considers the possible benefits of these restoration alternatives based on previous studies valuing other threatened ecosystems and species, the benefit-cost ratio, and indeed the net benefits, could very well likely be large. Clearly, for a more accurate representation of the benefits associated with restoration, a more specific and detailed valuation study of the restoration alternatives associated with the Salton Sea would need to be performed. Yet with limited time before the legislature makes a decision based on the alternatives presented to it, information on the possible returns from restoring the Salton Sea may be gleaned from previous studies that have confronted similar situations. Time and time again, it seems to be the case that when the non-market benefits of these unique natural resources are placed on equal footing with the costs of restoration, preservation seems to come out as the economically efficient strategy. And from our perspective, we see no reason why such benefits should not be given standing in light of such precedence by other agencies, mandates, and legislation at both the state and federal level.

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Table 1. Previous Environmental Benefits Estimates with Potential Relevance for the Salton Sea Restoration Project.

Source	Summary	Relevance	Comments
San Joaquin Valley			
Jones & Stokes Associates, Inc. 1990. Final Report: Environmental Benefits Study of San Joaquin Valley's Fish and Wildlife Resources. (JSA 87-150). Sacramento, CA. Prepared by J.B. Loomis, W.M. Hanemann, and T.C. Wegge.	Estimates that the average household in CA would be willing to pay $154 annually to avoid losing 58,000 acres of **wetlands in the SJV,** or $254 annually to obtain 40,000 additional acres. Estimates that the average household in OR, WA, and NV would be willing to pay $92 annually to avoid the same loss, or $161 annually to obtain the same increase. *Current values in CA: $250 or $413 annually per household* *Current values outside CA: $150 or $262 annually per household*	Evidence of significant value held by western U.S. residents for wetlands maintenance and improvement in the California section of the Pacific Flyway. Demonstrates significant value beyond the vicinity of the resource.	Baseline wetland acreage was 85,000 (about 10% of original wetland acreage in the SJV). Total value probably consists mostly of non-use values. Approximately 78% of the aggregate value is held by CA residents living outside the SJV. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Ibid.	Estimates that the average household in CA would be willing to pay $188 annually to avoid increasing the **population of resident SJV wildlife exposed to agricultural drainage contaminants** to 95%; or $313 annually to reduce the exposed population to 20%. Estimates that the average household in OR, WA, and NV would be willing to pay $93 annually to avoid the same increase, or $131 annually to obtain the same decrease. *Current values in CA: $306 or $509 annually per household* *Current values outside CA: $151 or $213 annually per household*	Evidence of significant value held by western U.S. residents for limiting or mitigating the effects of agricultural drainage on resident wildlife populations in California. Demonstrates significant value beyond the vicinity of the resource.	Baseline exposure level was 70%. Total value probably consists mostly of non-use values. Approximately 80% of the aggregate value is held by CA residents living outside the SJV. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Loomis, J. et al. 1991. Willingness to Pay to Protect Wetlands and Reduce Wildlife Contamination from Agricultural Drainage. In A. Dinar and D. Zilberman, eds., *The Economics and Management of Water and Drainage in Agriculture*. Boston: Kluwer.	Estimates that California residents would be willing to pay $1.52 billion annually to avoid losing 58,000 acres of **wetlands in the SJV**; or $2.50 billion annually to obtain 40,000 additional acres. *Current values: $2.5 or $4.1 billion annually to California residents alone*	Evidence of significant aggregate value held by California residents for wetlands maintenance and improvement in the California section of the Pacific Flyway.	Baseline wetland acreage was 85,000. Total value probably consists mostly of non-use values. Suggest caution applying these results to the Salton Sea due to different population & site characteristics. Same results provided in Jones & Stokes (1990).

Source	Summary	Relevance	Comments
Ibid.	Estimates California residents would be willing to pay $1.85 billion annually to avoid increasing the **population of resident SJV wildlife that is exposed to agricultural drainage contaminants** to 95%; or $3.08 billion annually to reduce the exposed population to 20%. *Current values: $3 or $5 billion annually to California residents alone*	Evidence of significant aggregate value held by California residents for limiting or mitigating the effects of agricultural drainage on resident wildlife populations in California.	Baseline exposure level was 70%. Total value probably consists mostly of non-use values. Suggest caution applying these results to the Salton Sea due to different population & site characteristics. Same results provided in Jones & Stokes (1990).
Hanemann, M. et al. 1991. Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation. *American Journal of Agricultural Economics* 73:1255-63.	Estimates the average household in CA, OR, WA, and NV would be willing to pay $152 annually to avoid losing 58,000 acres of **wetlands in the SJV**; or $251 annually to obtain 40,000 additional acres. *Current values: $247 or $408 annually per household in western U.S.*	Evidence of significant value held by western U.S. residents for wetlands maintenance and improvement in the California section of the Pacific Flyway.	Baseline wetland acreage was 85,000. Total value probably consists mostly of non-use values. Implements a more efficient statistical method. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Ibid.	Estimates the average household in CA, OR, WA, and NV would be willing to pay $187 annually to avoid increasing the **population of resident SJV wildlife that is exposed to agricultural drainage contaminants** to 95%; or $308 annually to reduce the exposed population to 20%. *Current values: $304 or $501 annually per household in western U.S.*	Evidence of significant value held by western U.S. residents for limiting or mitigating the effects of agricultural drainage on resident wildlife populations in California.	Baseline exposure level was 70%. Total value probably consists mostly of non-use values. Implements a more efficient statistical method. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Creel, M. and J. Loomis. 1992. Recreation Value of Water to Wetlands in the San Joaquin Valley: Linked Multinomial Logit and Count Data Trip Frequency Models. *Water Resources Research* 28(10):2597-2606.	Estimates that the annual benefits derived by the average visitor to **wetlands in the SJV** by recreation type: Wildlife viewers….$128-$152 annually Anglers……………$126-$137 annually Hunters………….. $149-$159 annually *Current values per visitor:* *Wildlife viewer……$209-$248 annually* *Angler…………….$205-$223 annually* *Hunter……………. $243-$259 annually* Also, estimates aggregate value for all 14 sampled destinations (current annual value ≈ $130 million).	Evidence of significant use value associated with wetlands in the California section of the Pacific Flyway.	Range of values due to different assumptions of statistical model. Suggest caution applying these results to the Sea due to different population & site characteristics. Estimates that increasing wetland water allocations to optimal levels would increase benefits by around 17%. Finds that values for multi-purpose users are greater than the sum of the values for single-purpose users. These values should not be added to the preceding estimates.

Source	Summary	Relevance	Comments
Hoehn, J.P. and J.B. Loomis. 1993. Substitution Effects in the Valuation of Multiple Environmental Programs. *Journal of Environmental Economics and Management* 25(1): 56-75.	Estimates that the average household in the SJV would be willing to pay $120 annually to avoid losing 58,000 acres of **wetlands in the SJV**; or $166 annually to obtain 40,000 additional acres. *Current values: $195 or $270 annually per household in SJV*	Evidence of significant value held by SJV residents for wetlands maintenance and improvement in the California section of the Pacific Flyway.	Baseline wetland acreage was 85,000. Total value probably consists mostly of non-use values. Considers cross-policy substitution effects not addressed by preceding studies, and derives lower values. Suggest caution applying these results to the Sea due to different population & site characteristics.
Ibid.	Estimates that the average household in the SJV would be willing to pay $113 annually to avoid increasing the **population of resident SJV wildlife that is exposed to agricultural drainage contaminants** to 95%; or $184 annually to reduce the exposed population to 20%. *Current values: $184 or $299 annually per household in SJV*	Evidence of significant value held by SJV residents for limiting or mitigating the effects of agricultural drainage on resident wildlife populations in California.	Baseline exposure level was 70%. Total value probably consists mostly of non-use values. Considers cross-policy substitution effects not addressed by preceding studies, and derives lower values. Suggest caution applying these results to the Sea due to different population & site characteristics.
Pate, J. and J.B. Loomis. 1997. The Effect of Distance on Willingness to Pay Values: a Case Study of Wetlands and Salmon in California. *Ecological Economics* 20(3):199-207.	Estimates that the average household in CA would be willing to pay $211 annually to obtain 40,000 additional acres of **wetlands in the SJV**. Estimates that the average household in OR, WA, and NV would be willing to pay $103 annually to obtain the same increase. *Current values in CA: $343 annually per household* *Current values outside CA: $167 annually per household*	Evidence of significant value held by western U.S. residents for wetlands improvement in the California section of the Pacific Flyway. Demonstrates significant value beyond the vicinity of the resource.	Baseline wetland acreage was 85,000. Total value probably consists mostly of non-use values. Estimates how distance from the resource affects value, and calculates values for each state. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Ibid.	Estimates that the average household in CA would be willing to pay $223 annually to avoid increasing the **population of resident SJV wildlife that is exposed to agricultural drainage contaminants** to 95%. Estimates that the average household in OR, WA, and NV would be willing to pay $91 annually to avoid the same increase. *Current value in CA: $363 annually/hh* *Current value outside CA: $148 annually/hh*	Evidence of significant value held by western U.S. residents for limiting the effects of agricultural drainage on resident wildlife populations in California. Demonstrates significant value beyond the vicinity of the resource.	Baseline exposure level was 70%. Total value probably consists mostly of non-use values. Calculates values for each state. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.

Source	Summary	Relevance	Comments
An, M.Y. 2000. A Semi-Parametric Distribution for Willingness to Pay and Statistical Inference with Dichotomous Choice Contingent Valuation Data. *American Journal of Agricultural Economics* 82:487-500.	Estimates that the average household in CA but outside the SJV would be willing to pay between \$155 and \$190 annually to obtain 40,000 additional acres of **wetlands in the SJV**. *Current value: \$252-\$309 annually per household in CA not in SJV*	Evidence of significant value held by California residents for wetlands improvement in the California section of the Pacific Flyway.	Baseline wetland acreage was 85,000. Total value probably consists mostly of non-use values. Range of values due to different assumptions in statistical model. Suggest caution applying these results to the Sea due to different population & site characteristics.
Mono Lake			
Loomis, J. 1987. Balancing Public Trust Resources of Mono Lake and Los Angeles' Water Right: An Economic Approach. *Water Resources Research* 23(8):1449-1456.	Estimates that the average household in CA would be willing to pay between \$3.27 and \$7.43 monthly to avoid lowering the **water level in Mono Lake** from 6,372 feet above MSL to 6,342 feet; and between \$9.58 and \$21.78 monthly to raise it from 6,372 feet to 6,387 feet above MSL. *Current values: \$6.12-\$13.91 and \$17.94-\$40.79 monthly per household in CA depending on increase in elevation.*	Evidence of significant value held by California residents for preservation of saline lake habitat that supports migratory waterfowl, including Eared Grebes, in the California section of the Pacific Flyway.	Range of values is due to different assumptions about how to extrapolate individual values to the California population. Total value probably consists mostly of non-use values. The lower numbers are considered conservative estimates. Suggest caution applying these results to the Sea due to different population & site characteristics.
Loomis, J. 1989. Test-Retest Reliability of the Contingent Valuation Method: A Comparison of General Population and Visitor Responses. *American Journal of Agricultural Economics* 71(1):76-84.	Estimates that the average household in CA would be willing to pay between \$4.72 and \$5.51 monthly to avoid lowering the **water level in Mono Lake** from 6,372 feet above MSL to 6,342 feet; and between \$4.12 and \$5.89 monthly to raise it from 6,372 feet to 6,387 feet above MSL. *Current values: \$8.87-\$10.14 and \$7.75-\$10.84 monthly per household in CA.*	Evidence of significant value held by California residents for preservation of saline lake habitat that supports migratory waterfowl, including Eared Grebes, in the California section of the Pacific Flyway.	Range of values is due to multiple surveys of the same population. Total value probably consists mostly of non-use values. Also surveyed Mono lake visitors and found their values to be about twice as high as non-visitors (reported here). Suggest caution applying these results to Sea due to different population & site characteristics.
Jones & Stokes Associates, Inc. 1993. Environmental Impact Report for the Review of Mono Basin Water Rights of the City of Los Angeles. Draft. May. (JSA 90-171) Sacramento, CA. Prepared for the California State Water Resources Control Board, Division of Water Rights, Sacramento, CA.	Estimates that California residents would be willing to pay \$81.90 annually to increase the **Mono Lake water level** from 6,372 feet above MSL to 6,377 feet; and \$9.26 annually to increase the water level from 6,377 feet to 6,390 feet above MSL. *Current values: \$117.63 and \$13.30 annually per resident.*	Evidence of significant value held by California residents for preservation of saline lake habitat that supports migratory waterfowl, including Eared Grebes, in the California section of the Pacific Flyway.	Survey asked respondents to consider slightly different water elevations; authors then adjusted the values to reflect the elevations considered in the EIR (shown here). Total value probably consists mostly of non-use values. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.

Source	Summary	Relevance	Comments
Endangered Species			
Boyle, K.J. and R.C. Bishop. 1987. Valuing Wildlife in Benefit-Cost Analysis: a Case Study Involving Endangered Species. *Water Resources Research* 23:943-950.	Estimates that the average resident of WI would be willing to pay between $4.16 and $5.66 per person annually to prevent the extinction of the **striped shiner**. *Current value: $7.80-$10.62 annually/person*	Evidence of significant value held by U.S. residents for preservation of an unfamiliar and uncharismatic endangered fish species.	Total value probably consists mostly of non-use values. Caution applying these results to the Salton Sea due to different population & site characteristics.
Bowker, J.M. and J.R. Stoll. 1988. Use of Dichotomous Choice Nonmarket Methods to Value the Whooping Crane Resource. *American Journal of Agricultural Economics* 70(2):372-81.	Estimates that respondents in Texas and four major U.S. cities (Los Angeles, Chicago, Atlanta and New York) would be willing to pay between $21 and $70 per person annually to help preserve the **whooping crane**. *Current value: $43-$142 annually/respondent*	Evidence of significant value held by U.S. residents for preservation of endangered bird species.	The relatively wide range of values is due to different assumptions made about the statistical model. Suggest caution applying these results to the Salton Sea due to different population & site characteristics. Respondents may have reported household WTP.
Loomis, J.B. and D.S. White. 1996. Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis. *Ecological Economics* 18(3):197-206.	Authors present a meta-analysis of valuation studies for **rare, threatened, and endangered species**.	Evidence of value associated with rare, threatened, and endangered fish and bird species.	Authors argue that even for the most costly endangered species preservation efforts, the benefits are likely to exceed the costs.
Loomis, J. and E. Ekstrand. 1997. Economic Benefits of Critical Habitat for the Mexican Spotted Owl: A Scope Test Using a Multiple-Bounded Contingent Valuation Survey. *Journal of Agricultural and Resource Economics* 22(2): 356-66.	Estimates that U.S. residents would be willing to pay $1.8-$3.7 billion annually to preserve habitat in AZ, CO, NM, and UT for the **Mexican Spotted Owl**. *Current values: $2.3-$4.8 billion annually*	Evidence of significant value held by U.S. residents for preservation of an endangered bird species.	Range of values is due to different assumptions made about the statistical model. The lower number is a conservative estimate. Suggest caution applying these results to the Salton Sea due to different population & site characteristics.
Stanley, D.L. 2005. Local Perception of Public Goods: Recent Assessments of Willingness-to-Pay for Endangered Species. *Contemporary Economic Policy* 23(2):165-79.	Estimates that the average household in Orange County, CA would be willing to pay $25 annually ($7.5-8 million for the entire county) to preserve the **Riverside fairy shrimp**, which otherwise would likely become extinct within the next 100 years. *Current values: $28 per household, or $8.5-9.0 million county-wide, annually*	The fairy shrimp is a non-charismatic endangered species that is not well-known by the public but is an important food source for migratory birds. Evidence of significant value held by southern California residents for habitat that supports migratory bird populations.	The author also argues for national support of species preservation efforts due to geographically wide-spread benefits. Suggest caution applying these results to the Salton Sea due to different population & site characteristics and/or distance.

Source	Summary	Relevance	Comments
		Waterfowl Hunting	
Brown, G.M. and J. Hammack. 1972. A Preliminary Investigation of the Economics of Migratory Waterfowl. In J.V. Krutilla, ed., *Natural Environments*. Baltimore: Johns Hopkins University Press.	Estimates the net economic value of **waterfowl hunting in the Pacific Flyway** is $25 per trip or $247 per season. *Current values: $145 per trip or $1,432 per season*	Evidence of significant use value associated with serviced provided by bird habitat in the Pacific Flyway.	Relatively old study. "Net economic value" refers to the difference between the benefit of a trip and its cost.
Hay, M. 1988. Net Economic Recreation Values for Deer, Elk, and Waterfowl Hunting and Bass Fishing. *U.S. Dept. of the Interior Fish and Wildlife Service*.	Estimates the net economic value of a **waterfowl hunting trip in the Pacific Flyway** is $25, and that of a **bass fishing trip in California** is $22. *Current values: $47 per trip for hunting and $41 per trip for fishing*	Evidence of significant use value associated with services provided by bird habitat in the Pacific Flyway and fish habitat in California.	Unable to locate publication (summary provided by EVRI). Total number of trips not provided. "Net economic value" refers to the difference between the benefit of a trip and its cost.
Duffield, J. and C. Neher 1991. Montana Waterfowl Hunting, A Contingent Valuation Assessment of Economic Benefits to Hunters. *Montana Department of Fish, Wildlife and Parks*.	Estimates the value of a **waterfowl hunting trip in the Montana section of the Pacific Flyway** is around $140. *Current value: $228 per trip*	Evidence of significant use value held by non-California residents for services provided by Pacific Flyway habitat.	Unable to locate publication (summary provided by EVRI). Total number of trips not provided. Also determines the effects of more/fewer birds on the value of a trip, but not specifically for Pacific Flyway trips.
		Other Studies	
Green, D., et al. 1998. Referendum Contingent Valuation, Anchoring, and Willingness to Pay for Public Goods. *Resource and Energy Economics* 20:85-116.	Estimates respondents in San Francisco, CA would be willing to pay around $64 per person annually to protect 50,000 **Pacific Coast seabirds** from off-shore oil spills. *Current value: $85 per person*	Demonstrates significant value held by California residents for protecting part of an aquatic-based west coast bird population.	The study was conducted primarily to test the contingent valuation method and it showed that WTP can be influenced by question structure. Caution applying these results to a large population or to the Salton Sea due to the survey design characteristics.
Boyle, K.J., et al. 1994. An Investigation of Part-Whole Biases in Contingent-Valuation Studies. *Journal of Environmental Economics and Management* 27(1): 64-83.	Estimates respondents in Atlanta, GA would be willing to pay at least $88 per person to protect 2% of the **migratory bird population in the Central Flyway** (200,000 birds) from presumably certain human-induced mortality. *Current value: $127 per person*	Evidence of significant value held by residents of a geographically separate region for protecting a small portion of a migratory bird population within a single flyway.	The study was conducted primarily to test the contingent valuation method and it showed that WTP did not increase with the number of avoided deaths. Caution applying these results to a large population or to the Salton Sea due to the survey design characteristics.

Source	Summary	Relevance	Comments
Loomis, J. B. 2000. Vertically Summing Public Good Demand Curves: An Empirical Comparison of Economic Versus Political Jurisdictions. *Land Economics* 76(2):312-21.	For six different resource preservation programs, estimates **the fraction of national value held by residents within the state(s)** where the resource is located. Finds, on average, that only 13% of total value is held by state residents.	Evidence of significant value held by out-of-state residents. Resources valued include: three California programs (wetlands, wildlife exposure to agricultural contamination, spotted owl) and three other programs focused on birds, fish, and rare/threatened/endangered species.	Confidence intervals are relatively wide and include 100% of national value for three of the programs, including two in California. Average percent of national value held by California residents is around 18%.
Johnston, R.J., et al. 2002. Valuing Estuarine Resource Services Using Economic and Ecological Models: The Peconic Estuary Study System. *Coastal Management* 30: 47-65.	Estimates that the average household in eastern Long Island, NY would be willing to pay around $0.066 annually to preserve an additional **acre of wetlands in eastern Long Island**. *Current value: $0.087 annually/household*	Evidence of value associated with incremental protection of wetlands.	Suggest caution applying these results to the Salton Sea due to different population & site characteristics. Also, WTP likely includes both use and non-use value.
Brander et al. 2006. The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature. *Environmental & Resource Economics* 33:223-50.	Authors present a meta-analysis of valuation studies for **wetland services** and estimate a meta-regression that can facilitate benefit transfer.	Evidence of value associated with ecological services provided by wetlands.	Benefit transfer errors average around 74%.

Notes: Current values for individual respondents and/or households are adjusted to 2006 dollars using the U.S. Department of Labor, Bureau of Labor Statistics Consumer Price Index. Aggregate values reported in the table are not adjusted for temporal changes in factors such as population (this does not apply to the main text). SJV = San Joaquin Valley. WTP = Willingness-to-pay. MSL = mean sea level. EIR = Environmental Impact Report. hh = household. NA = not applicable/available.

Table 2. Present Value of $1 Billion Annually for Various Discount Rates and Time Horizons.

Time (years)	Annual Discount Rate (%)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
5	4.85	4.71	4.58	4.45	4.33	4.21	4.10	3.99	3.89	3.79
10	9.47	8.98	8.53	8.11	7.72	7.36	7.02	6.71	6.42	6.14
15	13.87	12.85	11.94	11.12	10.38	9.71	9.11	8.56	8.06	7.61
20	18.05	16.35	14.88	13.59	12.46	11.47	10.59	9.82	9.13	8.51
25	22.02	19.52	17.41	15.62	14.09	12.78	11.65	10.67	9.82	9.08
30	25.81	22.40	19.60	17.29	15.37	13.76	12.41	11.26	10.27	9.43
35	29.41	25.00	21.49	18.66	16.37	14.50	12.95	11.65	10.57	9.64
40	32.83	27.36	23.11	19.79	17.16	15.05	13.33	11.92	10.76	9.78
45	36.09	29.49	24.52	20.72	17.77	15.46	13.61	12.11	10.88	9.86
50	39.20	31.42	25.73	21.48	18.26	15.76	13.80	12.23	10.96	9.91
75	52.59	38.68	29.70	23.68	19.48	16.46	14.20	12.46	11.09	9.99
100	63.03	43.10	31.60	24.50	19.85	16.62	14.27	12.49	11.11	10.00

Notes: Table entries are expressed in billions of dollars. Multiply entries by 5 to calculate the present value of $5 billion annually. Multiply by X to calculate the present value of $X billion annually.

ATTACHMENT 4

Large Attachments to Salton Sea Authority Comment Letter

Report to the
Salton Sea Authority
Economic Development Task Force

The Rose Institute of State and Local Government
Claremont McKenna College

Report to the
Salton Sea Authority
Economic Development Task Force

Rose Institute of State and Local Government
January 7, 1999

Table of Contents

Section I:
Introduction

I. Introduction

This report has been prepared for The Economic Development Task Force, an advisory body appointed by the Salton Sea Authority. The Economic Development Task Force engaged the Rose Institute of State and Local Government to prepare a report that would contain two main elements. The first element: a list of the potential revenue sources that could be used to help finance a proposed clean-up of the Salton Sea. The second element: a listing of the government entities involved in similar large, complex, ecologically challenging, water related projects. Additionally, some analysis of overall governance entity structure is provided.

The list of potential revenue sources is provided in section II.

Section III contains graphic and tabular data based on the economic projections developed by Professor Michael J. Bazdarich, Director of the Inland Empire Databank and Forecasting Center, Anderson Graduate School of Management, University of California, Riverside. Included in this section are brief discussions about the various attributes, pro and con, of each of the revenue streams reviewed.

The list of potential governmental structures that might be created to oversee the clean-up of the Salton Sea is provided in Section IV. In addition, this section contains some general observations about the attributes that any such governmental structure might possess.

Section V examines the potential consequences of allowing further deterioration of the Salton Sea.

Section VI estimates the total economic benefit of restoration of the Salton Sea.

The contents of this report reflect the input of the Economic Development Task Force at several meetings in November and December of 1998. The Rose Institute staff wishes to acknowledge the valuable insights provided by the Task Force and interested citizens who attended these meetings. This report benefited tremendously from their contributions.

Executive Summary

I. There is a large number of potential revenue sources that might be used. Many have substantial limitations, however.

II. The value of some of the potential revenue sources varies substantially, however.

   A. The revenue streams generated from the most probable sources could have a net present value as high as $361 million.
      1. Parking/entrance fees
      2. Salton Sea license plates
      3. Boat permits & launch fees
      4. Salton Sea fishing stamps

   B. The revenue streams that possible revenue sources might generate could have a net present value as high as $83 million.
      1. 0.5% sales tax increase in Salton Sea Focus Area
      2. Transient Occupancy Tax in the Salton Sea Focus Area

   C. The revenue streams that problematic sources might generate could be substantial, but cannot be estimated with any precision at this time.
      1. Geothermal energy production
      2. Casino
      3. Water transfers, conservation & recycling
      4. Redevelopment
      5. Diversion of increased property tax revenues

III. Any potential government structure will probably have to incorporate a substantial number of federal, tribal, state and local entities.

IV. Consequences of allowing further deterioration of the Salton Sea are substantial.

   A. Decreased property values of $731 million to $1.29 billion.
   B. Decreased economic activity of $161 million to $238 million.
   C. Environmental degradation, loss of habitat and bio-diversity, and decreases in the quality of life. Potential cost unknown at this time.

V. Overall economic benefits of Salton Sea restoration are substantial.

   A. $4.38 billion to $5.8 billion

Section II:
Potential Revenue Sources

II. Potential Revenue Sources

SALES AND USE TAXES

Advantages: The revenue base is broad and relatively stable, and thus a small percentage of the general sales tax can bring in significant revenues.

Limitations: Sales taxes are tend to be regressive, and thus equity is not attained. The cost/benefit relationship is not immediately obvious unless taxes on specific goods can be related and dedicated to related environmental programs, but this may prove administratively burdensome and too complex. States and localities may have statutory limitations on general sales tax increases and earmarking. Environmental dedication may be difficult to sustain.

FERTILIZER/PESTICIDE TAXES

Advantages: The tax could generate significant revenues because of the relatively large volume of fertilizers and pesticides used. States could employ graduated rate structures which vary according to the toxicity of the ingredients in each item, thus improving upon equity considerations. Such taxes are relatively easy to collect if imposed on producers directly, and may also discourage excessive use of harmful products (although this would result in declining revenues). Taxes could include residential garden use.

Limitations: Although there is a direct cost/benefit relationship between agricultural chemical use and pollution, it would be difficult to apply all revenue receipts to non-point source projects because such projects are generally lower cost compared to point source projects. The tax is highly regressive and inequitable in terms of the cost to small farmers versus large agricultural businesses, and impacts vegetable and fruit producers especially hard. These taxes would be strongly opposed by the agricultural lobby because of the importance of fertilizers/pesticides to reliable crop production. Pollution "havens" between States might be created if the taxes were not uniform across States. As a sales tax, fertilizer/pesticides taxes might be as efficiently and equitably administered at the Federal as opposed to State level, although then would fall most heavily on crop producing States.

GREEN PRODUCT TAXES

Advantages: These taxes could generate significant revenues, if a wide array of products were included in the tax base and rates were at several percentage points (e.g. 3% or more) of sales price. When collected directly from producers/manufacturers as opposed to over-the-counter, they are relatively easy to collect. Green product taxes might heighten awareness of the potential negative environmental impacts of such products, and lead to behavioral shifts such as conservation and the development of new, "safe" products (although this would result in a decline in revenue).

Limitations: These taxes are highly regressive, impacting both small producers and consumers adversely. It will be difficult to define and limit the tax base, as the list of harmful products is so large, and empirical data on adverse environmental impacts are very small. The lack of quantitative toxicity data means that it would be difficult to employ a more equitable, graduated rate system for different products. Administrative complexities also pertain to the stability and predictability of the revenue stream, as new products and producers will appear or disappear over time, and be imported. These taxes create pollution havens if the tax base and rates are not uniform across States, which would be very difficult to achieve. Industry and consumer resistance may be high. For many products, green taxes may be best administered as a federal and not State tax program.

HOTEL TAXES

Advantages: Occupancy taxes spread the costs of maintaining State and local natural areas and government services to those who benefit from them. Because non-local and out-of-state residents must pay such taxes, they are equitable and maintain a good cost/benefit relationship.

Limitations: Since the demand for hotel space is relatively elastic, a price increase could reduce occupancy rates, and ultimately tax revenues, particularly if a city or county unilaterally imposes an occupancy tax higher than in surrounding areas. If no occupancy tax currently exists, collecting occupancy information for hotels, motels, and rental units each month could involve high administrative costs. Revenue yield might be low, unpredictable, and lack stability.

MARINE AND AVIATION TAXES

Advantages: Implementing marine fuel taxes assures equity among all gasoline and diesel fuel users, although current marine fuel rates generally are lower than highway gasoline taxes. Having boat and barge users pay some of the costs of pollution control associated with their activities creates a solid cost/benefit relationship, as well as heightening awareness of potential water quality problems. Aviation-related taxes can be a particularly good source of local revenue and, similar to rental car taxes, help ensure equity by including out-of-state travelers..

Limitations: If a State does not already tax marine and aviation fuel, it could be costly to set up a collection and accounting system. The same is true for local mooring and port taxes. The revenue stream probably will fluctuate depending on a number of factors, including weather and travel conditions, and the current cost of air travel.

REAL ESTATE TRANSFER TAXES

Advantages: Since real property values are high, a real estate transfer tax based on value generates a large amount of revenue at relatively low rates. Most governments already have a system in place for recording real estate sales which could ease collection. Tax rates would be graduated so that tax is reasonably equitable as is the cost/benefit relationship.

Limitations: The revenues are dependent on the level of activity in the real estate market, which is subject to wide and frequent fluctuation depending on economic conditions, weather, and other factors. Thus, tax revenues may not be reliable. The application of the tax may have inequitable distribution effects, and may cause an increase in housing costs in some areas.

RENTAL CAR TAXES

Advantages: Rental car taxes could spread the costs of maintaining air and water quality to those who benefit from it, including out-of-county and out-of-state visitors, which enhance equity considerations. These taxes might also serve as an incentive for visitors to

use public transportation, reducing mobile source emissions but producing a corresponding drop in revenues.
Limitations: At the local level, imposing a new tax or increasing an existing tax could cause a city or county to lose rental car business to other, lower-tax counties. Similarly, State business could be affected negatively. Revenue yield may be small and unpredictable.

BOND ISSUANCE FEES
Advantages: Such fees could provide a significant revenue stream when bond issuing amounts are high. If graduated fee schedules are established, fees are equitable and provide a good cost/benefit ratio depending on rededication.
Limitations: The revenue stream is unpredictable since it depends on the local demand for financing, which is influenced by environmental compliance issues, local debt capacity, and readiness to proceed with construction. State private-activity revenue bond issuance fees may result in a lack of State competitiveness with local industrial development authorities, which already may have lower bond issuance costs. Fees add to the carrying costs of local agencies undertaking infrastructure work, and thus may seem counter-productive. The administrative costs of collecting fees on very small bonds may be prohibitive.

LICENSING AND RECREATIONAL FEES
Advantages: These fees can cover expenses for public use of environmentally sensitive areas, and still represent an untapped revenue source in many States.
Charging fees would allow State general revenues to be used for other purposes. Most license fees have built in enforcement mechanism, since the licensing government can revoke the privilege granted with the license if fees are not paid, and provide a direct cost/benefit relationship. Equity is enhanced because out-of-state tourists must pay for the environmental impacts of increased tourism in an area.
Limitations: It may be difficult to institute recreational fees if use of State waters and parks has historically been free. Such fees may have a disproportionate impact on lower-income segments of the population who may have few other low cost recreational opportunities. Since they generally apply only to a limited population, most license fees have a small revenue base, and it may be difficult to raise significant revenues if fees are set at low levels.

LOCAL WATER/WASTEWATER UTILITY USER FEES
Advantages: Utility user fees provide services that most residents require. Thus, the fee base is large enough to provide a strong and reliable revenue stream at relatively low, equitable rates. Graduated rate structures would improve equity. Small rate increases can raise significant revenues while imposing a fairly small increased burden on households. The cost/benefit relationship is clear and rational rate-setting increases public awareness of the true cost and environmental benefits of water-related services.
Limitations: Many localities are accustomed to subsidized rates. This makes rate increases difficult. In small or economically disadvantaged communities, reliance on user fees for operations and maintenance as well as capital financing may be unaffordable, based on fiscal indicators such as median household income and community debt

capacity. Smaller communities may not have the management and other tools to reevaluate their rate structures with many complex policy choice issues.

PERMITTING FEES

Advantages: Permit fees may cover some or all of the start-up costs associated with the permit application process. Graduated fee rates based on toxicity, such as used for effluent-based permits in Louisiana, New Jersey and Louisiana, and hazardous waste permit fees in New York, could generate a significant revenue stream dedicated to State capital-generation for environmental infrastructure.
Graduated rates may encourage pollution reduction, and wetland permits encourage wetland conservation and provide State governments with advance information about wetland building plans. Fee collection is relatively straightforward.
Limitations: Revenue yield in most States is modest, and somewhat unpredictable. Flat rates may be inequitable, particularly for minor facilities which constitute the majority of permittees, and facility owners may not see a close cost/benefit relationship. Tracking ownership and development of wetlands and underground storage tanks can be administratively complex and expensive.

PRODUCT REGISTRATION FEES

Advantages: If set high enough, and proportional to anticipated product production, such fees may increase awareness of harmful products on the part of consumers and influence conservation of use or product substitution. Fee revenues dedicated to research and data collection on new, environmentally-degrading products would result in a good cost/benefit relationship. Fees also may enable the placement of limits or regulations on the sale of such products, and at least provide advance notice of new products coming on the market.
Limitations: Product registration fees will face opposition from the producers, who may already have gone through complicated and expensive federal approval processes, such as the Food and Drug Administration certification.

STATE PUBLIC WATER SUPPLY WITHDRAWAL FEES

Advantages: This type of broad-based, low level fee could yield high revenue. The regressiveness of flat fees could be avoided by using graduated fee rate structures or percentages. The cost/benefit relationship is strong, and State fees may increase awareness of the true cost of water services. The demand for public water, particularly by industry, is relatively inelastic, resulting in a stable and predictable revenue stream.
Limitations: The revenue base of the public water supply withdrawal fee is severely limited, however, because water supplied by utilities resents only a very slim portion (about 12%) of all water use in this country. The majority of water use results from direct withdrawals from ground and surface water sources by industry, mining, hydroelectricity and agriculture, and private wells. Legislation would be required, and local utilities may resist rebating fees to the State level. New fees would be unpopular with water utilities, both public and private, which oppose incremental increases in user fees because of lack of community support particularly when fees are redistributed to other localities. New State administrative procedures would be required to collect fees from utilities.

SPECIAL ASSESSMENTS

Advantages: The advantages of this kind of financing accrue to the potential revenue yield, which could be stable, and to increased equity and an improved cost/benefit relationship. Extending revenue requirements to suburban residents, who may have lower infrastructure costs and more ability to pay, relieve some of the burden on inner city residents. Asking inner city residents to pay for developments in the suburbs, may prove inequitable. Incentives in terms of recognition of the true costs of environmental services is important.

Limitations: These financing methods require the ability of the passing of local ordinances and the creation of special financing districts, which may have to be approved by State government, which is often difficult. They require administrative systems that may be costly to manage over time. It is not possible to achieve total equity, as there may be no ability to collect, for example, from downstream users benefiting from upstream water quality improvement. Assessments based on predictions of property value increases, and documentation of results, requires strict record-keeping and periodic reassessments which may require special management tools not available to communities.

EFFLUENT CHARGES

Advantages: Effluent fees could generate significant and reliable revenue on an annual basis. The cost/benefit ratio is satisfactory since the "polluter pays" principle exists. Fees could provide strong environmental incentives to reduce the discharge of harmful pollutants. If tied to NPDES permit issuance and renewal, fees could be collected by permit writers.

Limitations: Effluent fees remain some of the most challenging to design and administer because of data limitations and policy concerns. Although self-reported Toxic Release Inventory (TRI) data are used to estimate volume and toxicity, the TRI covers major industrial toxic discharges only and no standardized toxicity measures (or "weights") exist. Thus it is difficult to institute graduated rate structures which characterize true effluent fee systems, and even more complex to relate discharges to receiving water quality, because waste streams vary in dilution and receiving water quality varies considerably. The inability to relate fees to specific environmental damage reduces the equity of fees and also the directness of the cost/benefit ratio.

Flat-rate fees are more simple and less easily circumvented through dilution or media transfers. However, even this approach appears to impact heavily, and disproportionately, on the chemical and allied product industry and, secondarily, on the pulp and paper industry. Effluent fees are highly unpopular with industry and municipalities.

EXACTIONS

Advantages: Developers pay the true cost of community expansion out of their direct benefit from that expansion. Thus, some equity and cost/benefit relationship is achieved, but the way some exactions are privately negotiated may leave equity issues in doubt. When exactions take the form of construction materials or facilities, having the developer do the construction may be cheaper and faster than having it done by the governmental jurisdiction. Since they can be individually negotiated, exactions allow more flexibility than fixed impact fees discussed later. The revenue collected by monetary contributions, or represented by cost-savings on facilities built, could be significant.

Limitations: Since they are individually negotiated, exactions are not always considered as predictable or equitable a system as impact fees. Fairness may be further decreased as politics may enter into private negotiations. The revenue source is only as predictable as the economic conditions affecting the construction industry. Additionally, it is problematic if these fees are not just transferred to the end purchaser.

IMPACT FEES

Advantages: The beneficiaries of services pay specifically for the extension of local government facilities to them, rather than being subsidized by current users. This results in enhanced equity and a close cost/benefit relationship.
Impact fees cover non-subdivision projects such as condominiums and commercial developments. From a developers perspective, impact fees may replace more unpredictable, negotiated exactions. Impact fees may help local governments to plan for growth.
Limitations: Impact fees do not provide capital much in advance of development, unless impact "rights" are sold up-front. It may be difficult for localities to ascertain the capital needs and thus size the fees. Impact fees are criticized for deterring development and increasing new housing costs, and resulting in interjurisdictional competition. Also, communities may change their policy preferences depending on economic conditions, for example, finding a need to subsidize new development rather than the reverse. Developers may well pass on impact fees to residents.

SEVERANCE TAXES

Advantages: Severance taxes can yield significant revenues, which could be sufficient to dedicate to environmental infrastructure capital-generation. Charges are highly equitable especially when based on the current market value, not volume, of material mined or harvested. When dedicated promptly to activities that will mitigate impacts, particularly near the same site, these taxes have a high cost/benefit ratio. For sensitive activities such as timber cutting, and wetland alteration, the State will be given advance notice of impending activity.
Limitations: By definition, severance tax revenues depend on the level of extraction activity, or price of the material extracted. If the tax base or commodity price fluctuates, (e.g., shellfish harvest varies widely from year to year as do oil and gas prices), revenues may not be suitable for funding environmental program costs that require stability. Lobbies in some States have defeated passage of severance taxes, and resisted dedication.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT COMMUNITY DEVELOPMENT BLOCK GRANTS (CDBG) ECONOMIC INITIATIVE GRANTS

Advantages: Equity and leveraging opportunities are high and built into the program. Some very specific environmental projects have been completed in low-income areas.
Limitations: EDI grant funds are constrained in that they may only be used in conjunction with projects and activities assisted under the Section 108 loan Program. Principal beneficiaries of the grants must be low and moderate income persons. Many non-environmental projects are funded and payment is on a cost-incurred basis.

ECONOMIC DEVELOPMENT ADMINISTRATION (EDA) PUBLIC WORKS & INFRASTRUCTURE DEVELOPMENT GRANTS

Advantages: The program has had a significant environmental focus. Grants have on occasion been combined with State revolving fund loans and rural utility grants/loans for water and wastewater. Aid to the private non-profit sector enhances leveraging opportunities.

Limitations: Grants are limited to communities experiencing severe economic distress. Also, communities must generally provide matching funds of up to 50 percent. Further, grant funds are disbursed for costs incurred only after all construction contracts have been awarded. EDA grants have historically been somewhat unstable.

EDA SPECIAL ECONOMIC DEVELOPMENT & ADJUSTMENT ASSISTANCE GRANTS

Advantages: The potential to use grant monies for environmental improvements in disaster areas is high, as improved environmental services are crucial. Equity and leveraging potential are also strong.

Limitations: Grants are limited to areas experiencing sudden economic distress or long-term economic decline. Communities participating in the program must provide matching funds equal to 25 percent of the grant received. The program supports many non-environmental projects, and funding had varied considerably over the years.

ENVIRONMENTAL PROTECTION AGANCY (EPA) PROGRAM GRANTS

Advantages: Federal grants provide State and local governments with the means of meeting national environmental quality goals. They may also provide funds otherwise unavailable to State or local programs, thus enhancing equity, environmental incentives, and financial leveraging considerations

Limitations: Funds may be targeted to specific statutory goals. Programs must compete for limited funds and sign EPA grant agreements to perform activities. Each grant is very specific, thus limiting State and local flexibility.

EPA – PERFORMANCE PARTNERSHIP GRANTS (PPGs)

Advantages: PPGs give States and Tribes more flexibility to address their highest environmental priorities, thus increasing equity and environmental incentives. They provide incentives to States and Tribes to improve environmental performance and links between program goals and outcomes. PPGs also cut administrative burdens/costs for recipients and EPA by reducing the numbers of grant applications, budgets, work plans and reports. EPA will build partnerships with States and Tribes via shared goals and division of responsibilities.

Limitations: No extra funds are available via use of PPGs. States and Tribes must first develop environmental indicators and performance measures to ensure progress is made to agreed on goals.

ENVIRONMENTAL TECHNOLOGY INITIATIVE

Advantages: Use of the innovative environmental technologies being developed and promoted by ETI partnerships and projects can cut regulatory compliance costs, reduce public health risks, gain superior environmental results, make companies more efficient and competitive, and improve community environmental services.

Private sector equity, environmental incentives, and leveraging possibilities are all high.
Limitations: Before innovative environmental technologies can achieve regulatory acceptance, technology developers must decipher and meet a disjointed system of verification requirements in each State where a potential market exists. Once regulatory acceptance is achieved, the innovative technologies must then prove themselves and gain acceptance for actual field use.

FOUNDATION AND CORPORATE GIVING

Advantages: These grants are not directly dependent on tax dollars and grant conditions may be less burdensome. Innovation is encouraged and equity provided since grantees are not supported by governments. Grantees are forced to leverage other resources or become self-sustaining.
Limitations: Funding levels may be highly variable, competition for resources is very intense and awards are usually directed to innovative projects. Environmental impacts may be limited if projects are too small and esoteric. Since funding is typically for very short, defined periods of time, it is a real challenge for grantees to succeed or become independent.

RURAL BUSINESS – COOPERATIVE SERVICE BUSINESS ENTERPRISE GRANTS

Advantages: Both public and private entities may be supported. The projects supported may have specific and significant environmental impacts.
Limitations: Priority for the grants is given to rural areas having a population of 25,000 or less. Other priorities include projects located in communities with a large proportion of low-income population; projects located in areas with high unemployment, projects that will retain existing jobs, and projects that will create new jobs. Many projects may not have an environmental focus.

RURAL BUSINESS – COOPERATIVE SERVICE ECONOMIC DEVELOPMENT GRANTS

Advantages: The grants are inherently equitable since they fund projects that would not otherwise be funded for an often needy segment of society. When revolving loan funds are created, leveraging is very high.
Limitations: The maximum grant amount is $400,000. The maximum loan term is ten years at a zero interest rate. Grantees must provide supplemental funds totaling 20 percent of the assistance received from this program.

RURAL UTILITIES SERVICE WATER AND WASTE DISPOSAL SYSTEMS GRANTS

Advantages: Equity and leveraging possibilities are high, since State revolving funds, as well as HUD and EDA grants or loans, can be combined with these grants. State revolving funds can pre-finance these grants (and/or loans), thus covering up-front design and initial construction costs.
Limitations: Projects cannot service areas in towns of over 10,000 people. Grants (as opposed to loans) are made only if needed to reduce user charges to a reasonable level. For a grant of up to 70 % of eligible costs, service area median household income must

be below the poverty level or below 80%t of the State nonmetropolitan median household income (whichever is higher).

AFFINITY MERCHANDISE

Advantages: Since the purchase of special affinity merchandise by individuals is entirely voluntary, costs are fairly distributed to those persons who choose to incur them. Such programs allow anyone to advocate environmental improvement and support it financially. Advertisement also develops public awareness of the natural resource that the product displays. When products and proceeds are directed to a specific local site, the cost/benefit link is close.

Limitations: Caution must exercised to ensure that the administrative costs of voluntary sales and tours justify the typically small amount of revenue raised, even if such programs are implemented primarily to heighten public awareness. Proliferation of many voluntary programs should be avoided. Governments may also be criticized for competing with the private sector.

CONTRIBUTIONS OF LAND

Advantages: Voluntary contributions of land and easements are a potentially large revenue source, or form of governmental cost-savings, and a valuable form of non-regulatory environmental protection. Potential cost-savings from pollution prevention in the first place, as opposed to cleaning up sites after the fact, could be notable, even if there is an initial governmental monetary outlay such as under the federal agricultural reserve program. The environmental incentives in term of enhancing public awareness of environmental needs are clear-cut, and the opportunity exists to attract additional public or private resources to manage lands set aside for protection is strong.

Limitations: As with all in-kind voluntary programs, revenue is unpredictable or non-existent. Administrative costs for future oversight may be high, and outright payments may prove to be too costly in light of the environmental protection to be achieved. Private easement programs may provide incentives to get rid of neglected land, which then must be managed or sold, by governments or non-profit organizations. Thus, these programs must be evaluated on a case-by-case basis.

INDIVIDUAL AND CORPORATE DONATIONS

Advantages: There is little public opposition to voluntary donations, and the advantage of enhancing public interest through a well-publicized campaign and equitable financing means can be extremely important. Although government revenue collection may be limited, money can provide valuable supplemental funding for specific cleanup programs. The ability to leverage additional financial resources, e.g., through corporate matching contributions and in-kind services, is high.

Limitations: Donations will fluctuate with the economy, and also to some extent depending on current tax code restrictions on philanthropic activity. Thus, the revenue stream is unpredictable and unreliable for financing some necessary program costs. Administrative costs may be high, and it may be difficult to track the use of funds which may be demanded by donors.

NONPROFIT ORGANIZATIONS

Advantages: One of the chief advantages of nonprofits is there ability to leverage more monetary donations, volunteer manpower, resources and in-kind services, from the private sector compared to public agencies. In part, this is because of the tax-exempt status of many contributions to nonprofits, but also because they provide a safe and seemingly unbiased focal point that draws attention to the resources being protected and environmental issues being addressed. NGOs may also be able to perform tasks more quickly and efficiently than government, because they have fewer bureaucratic procedures, and can effectively cross jurisdictions for greater ecosystem protection.
Limitations: Revenue generation may be quite unpredictable. Since nonprofits are controlled by their individual membership and boards, they may evolve over time and cannot always be held accountable by government, potentially undercutting the cost/benefit relationship. Some nonprofits are criticized for using too large a portion of donations for internal, administrative purposes.

CERTIFICATES OF PARTICIPATION

Advantages: Certificates of participation do not require voter approval, and do not count against debt capacity limits. In some States, special districts cannot issue bonds but may issue certificates backed by equipment.
Limitations: These certificates can only be issued to finance physical capital that is suitable as collateral, and only in jurisdictions in which local authorities are allowed to negotiate long-term leases.

DOUBLE-BARREL BONDS

Advantages: Double-barrel bonds are a good way for States or localities with a low credit rating to obtain lower interest rates on bond issues.
Limitations: Some State or local governments may have statutory limitations on the issuance of double-barrel bonds, or they may be subject to the same statutory limitations as GO bonds.

GENERAL OBLIGATION BONDS

Advantages: GO bonds backed by full taxing power are regarded as safer than bonds backed by a single revenue source, and generally command lower interest rates and lower reserve fund requirements. GO bonds also have structural flexibility since the issuing government can repay the bond with a variety of revenue sources.
Limitations: Voter approval is frequently required for GO bonds. Many States and cities also place statutory limits on total GO debt, or on GO debt as a percent of property valuation.

PRIVATE ACTIVITY BONDS

Advantages: Qualified private activity bonds provide funding at tax-exempt rates of interest which should be lower than most alternative financing mechanisms. Although interest on such bonds is exempt from the regular income tax, interest on the bonds (other than for bonds issued for 501(c)(3) charitable organizations) is an item of "tax preference" for purposes of the alternative minimum tax.
Limitations: Bonds meeting the definition of private activity bonds may only be issued on a tax-exempt basis if, among other requirements, room is available under the

particular State's volume cap. Federal law imposes a limit on qualified private activity bond issuance for each State of $50 per capita or $150 million, whichever is greater. Private activity bonds issued for airports, docks, wharves, municipally-owned solid waste disposal facilities, and facilities used by 501(c)(3) charitable organizations do not require a volume cap allocation.

REVENUE BONDS

Advantages: Revenue bonds have grown in popularity primarily because they are free from the requirements of general obligation bonds, which must be approved by voters, are subject to debt ceiling limitations, and may carry other restrictions covering principal and interest repayments. In contrast, revenue bonds are issued by special authorities and districts, although these are created by local legislative bodies, and do not count against debt ceilings, although the national rating agencies take this into account in financial capability analyses. Revenue bonds can be issued in a timely manner, and debt can be specifically structured to meet project needs. Level annual debt payments ensure that future as well as present users of the new facilities will pay, thus enhancing equity.
Limitations: For some jurisdictions this process is more complicated. In New York, special revenue authorities must be created by the State legislature, and the State comptroller approves revenue bonds over a specific amount. Public authorities remove direct control over spending from local legislative bodies, including approval of user fees. Thus, political control is exercised only indirectly through the appointment of board and authority members. Some localities have strongly resisted the creation of revenue authorities and special districts. In California, such bonds probably require a popular vote.

SPECIAL ASSESSMENT BOND

Advantages: The great attraction of special assessment financing is that it is very equitable. Only those individuals, private firms, and other groups who directly benefit from the specific public improvements through improved services, quality of life, and/or increased property values are responsible for paying for them.
Limitations: Special assessment bonds are normally used only for the construction of a project and not for maintenance, which can prove to be quite expensive in its own right over the long-term. These bonds have speculative elements which must be allayed through backup measures such as limited tax increase authority, utility revenue pledges, and cash flows. Because only those who benefit from the projects must pay, these bonds may require high assessments which small and economically disadvantaged communities may not be able to afford. In California, such bonds probably require a popular vote.

REVOLVING FUND REVENUE BONDS

Advantages: Although SRF revenue bonds are issued at market rates, borrowers receive loans at below market interest rates for qualifying projects. Loan subsidies are derived from other loan repayments and/or investment income on SRF assets. Because of their high asset to liability ratio, SRF revenue bonds are high quality credits and provide market access to borrowers regardless of their individual credit ratings.
Limitations: Borrowers participating in federally funded SRF programs must comply with program requirements. SRF bonds usually mature within 20 years, while traditional

revenue bonds issued for wastewater projects extend out to thirty years and have greater structuring flexibility. In California, such bonds probably require a popular vote.

TAX INCREMENT BONDS

Advantages: TIF has the advantage of being able to define specifically the geographical boundaries and benefits of an environmental improvement. It ensures that those individuals or businesses actually benefiting from the improvement will help pay for it, thus increasing equity. TIF bonds for revitalization projects bonds may be backed by revenue pledges in addition to anticipated increases in property value, called "value capture", which makes them highly leveraged.

Limitations: TIF requires the ability to pass local ordinances and create special financing districts, which often has proven difficult. Tax increment bonds require effective administrative systems for property value tax accounting that may be costly and complicated to manage over time. Property tax assessments are somewhat subjective since they are based on predictions, and assessments must be fully documented, subject to strict record-keeping, and periodically reassessed. In California, such bonds probably require a popular vote.

NORTH AMERICAN DEVELOPMENT BANK

Advantages: The NADBank's strong private sector and loan orientations represent clear leveraging strengths, and enhances equity of access to loans for hard-to-finance projects.

Limitations: Only projects certified by the BECC can be financed by the NADBank. NADBank does not provide grants or equity funding. Many border communities may not be able to afford to repay loans in any form. Projects financed by the NADBank must address environmental issues within 100 kilometers of either side of the United States-Mexico border. NADBank capitalization may fluctuate in the future.

RURAL HOUSING SERVICE – COMMUNITY FACILTIES LOANS

Advantages: These loans are at zero interest and targeted to areas that are often economically disadvantaged. Equity and leveraging potentials are high, since State revolving funds, as well as HUD and EDA grants or loans, could be combined with these loans.

Limitations: Even with a zero interest rate, these loans must be repaid. Assistance is limited to community facilities in rural areas. The loans can be used to fund all development costs related to the community facilities, not just environmental costs. The competition for funding from the many different types of non-environmental projects is great.

STATE REVOLVING FUNDS – WASTEWATER

Advantages: The CWSRFs are able to provide localities with extremely low-interest loans at favorable terms. They can be considerably more flexible than commercial banks -- as States can adjust loan terms to suit localities' ability-to-pay.

Limitations: The competition among applicants for access to revolving loan funds can be intense and difficult. Federal requirements such as Davis-Bacon that apply in using CWSRF monies can increase project costs. Some small communities may not be able to afford any kind of loan.

BUILD/OPERATE/TRANSFER OR BUILD/TRANSFER/OPERATE)

Advantages: BOT and BTO arrangements allow the public sector to capitalize on the construction efficiencies of the private sectors such as faster time frames and lower construction costs. Depending on the individual arrangement, BOT and BTO may also allow the public partner to reap the benefits of private sector operating efficiencies. The arrangements may allow the private partner to enjoy the tax benefits of ownership and, in some cases, provide access to lower cost public financing.

Limitations: Like turnkey arrangements, BOT arrangements must be individually negotiated and traditional low-bid governmental procurement policies often do not work very well.

BORDER ENVIRONMENTAL COOPERATION COMMISSION

Advantages: Both the BECC and the NADBank have a strong private sector orientation. Private financial institutions and firms play a key role in financing, building, operating, and maintaining the infrastructure. Because of the strong private sector orientation, employment along the border and equipment suppliers have benefited from increased economic development.

Limitations: Projects that require grants or equity funding are not considered for certification by the BECC. There is considerable concern that border communities may not be able to repay loans of any kind. All projects certified by the BECC and funded by NADBank must address environmental issues within 100 kilometers of the US-Mexico border.

AGRICULTURAL CONSERVATION PROGRAM

Advantages: This type of program provides an incentive for farmers and ranchers to improve their behavior by adopting approved conservation management practices available for pollution abatement and control. The program is leveraged in the way that it requires recipients to share in the cost of approved conservation practices.

Limitations: Some smaller and/or needy farmers and ranchers may not be able to afford the cost-share aspect of the program.

ECOTOURISM

Advantages: If carefully targeted and properly implemented, ecotourism can protect valuable ecosystems while producing a source of revenue for the local community. In Rwanda, for example, ecotourism has helped save mountain gorillas from extinction. Rwanda's Volcano Park has become an international attraction and represents the third-world country's largest source of foreign exchange.

Limitations: Ecotourism may be infeasible, or even harmful, in natural areas that are too fragile to support visitation. For example, along popular Himalayan tourist routes, litter has been strewn on trails and the alpine forest devastated by travelers looking for fuel to heat food and bath water. On the other hand, many natural areas may not attract a sufficient number of paying visitors to warrant ecotourism. Some countries may decide not to use the revenues generated by ecotourism to protect and support the natural areas visited.

MITIGATION BANKING

Advantages: Requiring compensatory mitigation for public and private developments that cause unavoidable adverse impacts is consistent with the goal of protecting the nation's remaining wetlands. Mitigation banking offers a potentially more efficient and more beneficial approach by compensating in advance for unavoidable adverse impacts on wetlands caused by development projects rather than the more conventional case-by-case compensatory off-site mitigation. Mitigation banking can allow essential development projects to proceed without costly delays and, if properly designed, without compromising regulatory protection of wetlands.
Limitations: Mitigation banking may not offer significant revenue potential even though it requires compensation for adverse impacts on wetlands. Revenues are dependent upon the number and type of development projects that occur in areas covered by the mitigation bank.

SPECIAL DISTRICTS

Advantages: Costs are borne only by taxpayers who will benefit from improvements. Regional special districts can provide more specialized services than smaller governments (e.g., a regional solid waste authority may be more able to finance a solid waste facility than any one county.) Special districts can issue bonds, which reduces debt load on the general purpose government.
Limitations: Special districts are not directly accountable to the electorate -- most special district officials are appointed, not elected. May require special legislation in some areas.

TAX INCREMENT FINANCING

Advantages: Tax Increment Financing makes development self-financed. TIF is very flexible. Local control is retained and no debt limitation usually applies. Development risks are shifted from taxpayers to the bondholders. The revenue potential and generation is very clear and very specific.
Limitations: TIF bonds pose a greater risk to investors and, thus, bear higher interest rates than general obligation bonds. TIFs are complex. Financial, development, engineering, and other technical expertise are necessary. In California, TIF/Redevelopment bonds may only be used in blighted, urban areas.

LAND RECLAMATION BANKS

Advantages: Land reclamation banks combine planning, financing, management, cleanup, and redevelopment functions in a single organization allowing local efforts to be focused. Land reclamation banks may elect to assume environmental and financial liability risks that the private sector is unwilling to bear.
Limitations: Legislation may be necessary to establish a land reclamation bank. Considerable funding/capitalization may be necessary for a bank's startup and operational costs. There may be institutional pressure against consolidating many functions and authorities in a single agency or entity. If not run efficiently and successfully, they may constitute a resource drain on the public treasury.

TAX ABATEMENTS

Advantages: Tax abatements can make otherwise uneconomical projects attractive to property owners, developers, and financial supporters. These abatements can often provide a substantial incentive for all parties to participate in particular projects. If the new development is properly structured and successful, the community tax base will grow at a rate, and to a size, that more than offsets the loss of taxes due to the abatement. **Limitations**: Tax abatements detract from the resource base of States and communities. If given when investment would have occurred anyway, they represent the waste of an incentive and an unnecessary loss of resources. The granting of tax abatements only to select projects may raise concerns about equity.

Section III:
Financing Options: Advantages and Disadvantages

III. Financing Options: *A. Reasonably Likely Revenue Sources*

1. Revenues from Parking/Entrance Fees

Parking/Entrance Fees represent revenue from access to local, state, and federal parks around the Sea.

Year 1 Inception of Fees
Year 15 Year in which restoration project is substantially implemented.

Low – assumes fees increase by a factor of 5 by year 15 and 3% in subsequent years.
Medium – assumes fees increase by a factor of 10 by year 15 and 3% in subsequent years.
High – assumes fees increase by a factor of 15 by year 15 and 3% in subsequent years.

The combined total of visitors to the Imperial Wildlife Area, Salton Sea State Recreation Area, and Salton Sea National Wildlife Refuge was at least 275,000 during 1997. If we assume 3 visitors per vehicle then that is 91,667 vehicles per year. A parking fee of $5 per vehicle would generate $0.46 million per year. If total visits increased to twice the annual visits to Lake Perris or 4 million visitors per then parking fees would increase to $6.6 million per year which is the high figure that is reached in year 15.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

Not all of the funds could be utilized for Sea clean-up. Currently about $.40 on each dollar collected at State Parks goes to the state general fund and the balance to the State Park Revenues Fund. Special legislation would be necessary to capture all increased revenues for cleaning the Salton Sea.

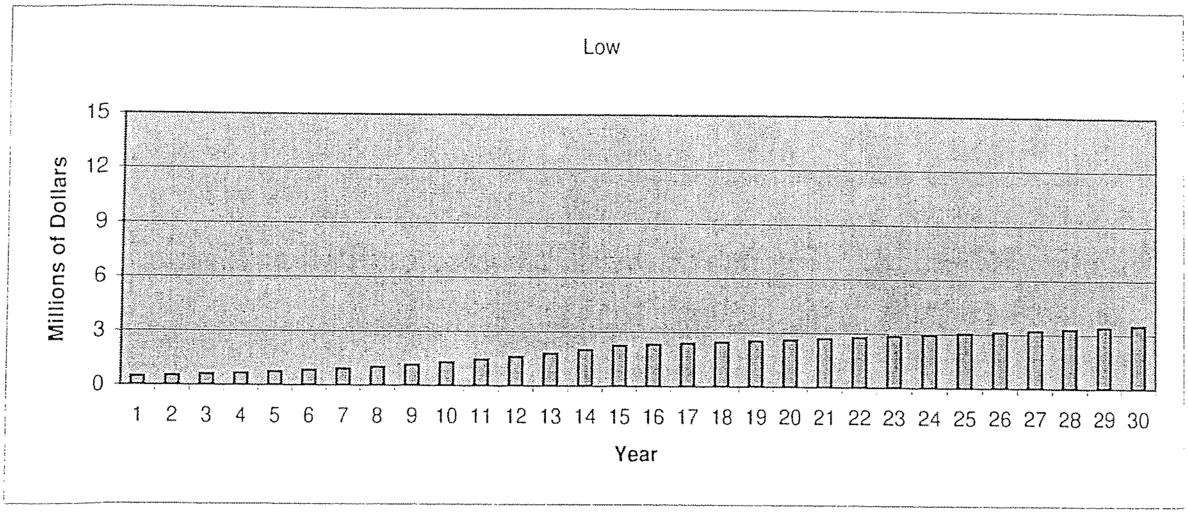
Table A (in millions of dollars)

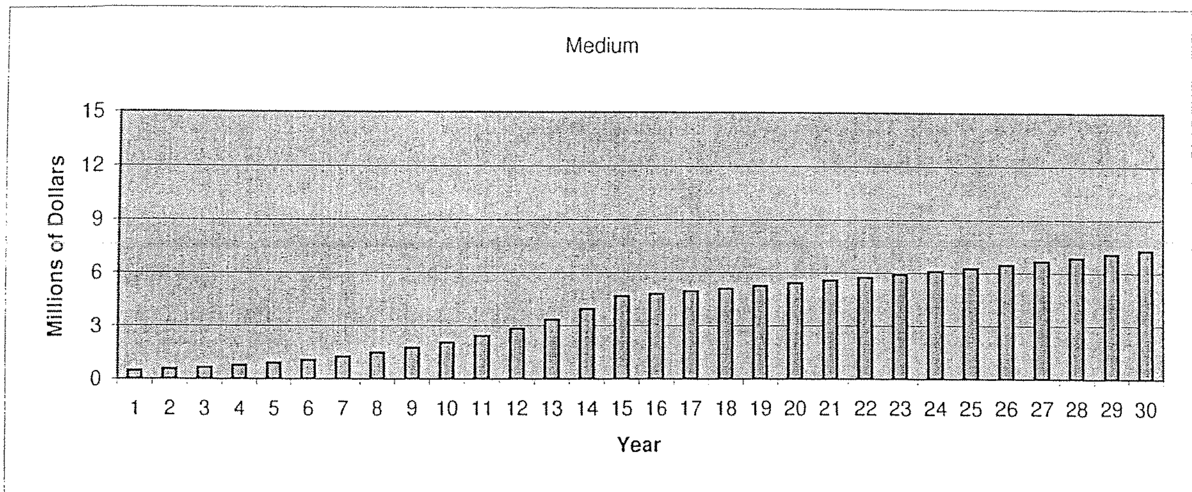
Year	Low	Medium	High
5	0.7	0.9	1.0
10	1.3	2.0	2.6
15	2.2	4.7	6.6
20	2.6	5.4	7.7
25	3.0	6.3	8.9
30	3.5	7.3	10.3

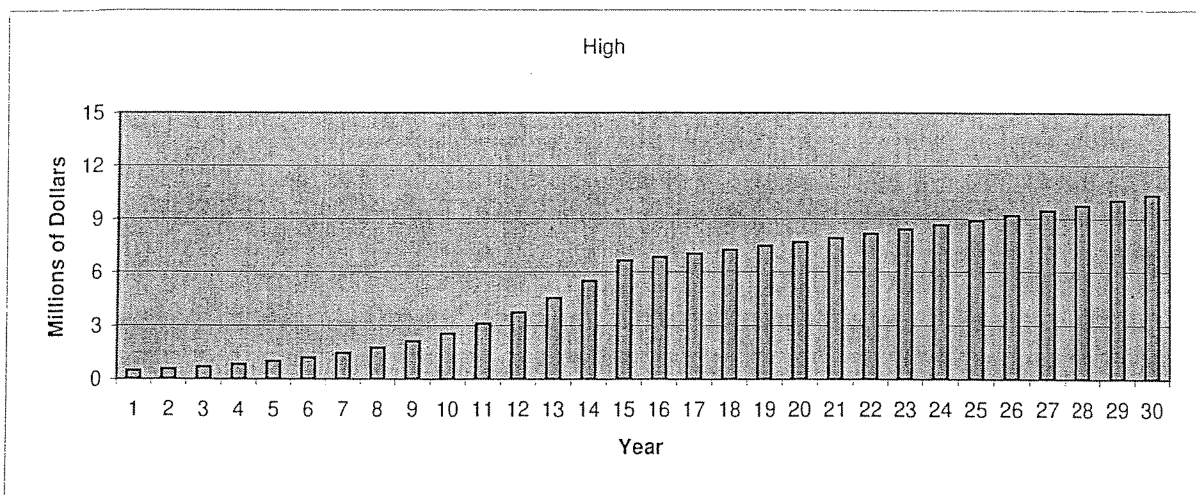
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	23	42	57

Annual Cash Flows from Parking Fees







A. Reasonably Likely Revenue Sources

2. Revenues from Salton Sea License Plate Sales

The state of California sells environmental license plates for designated geographical locations within the state (for example Yosemite Valley and Lake Tahoe). These projected revenues are based on estimates of the expected appeal of such license plates and the dedicated revenue generated from their sale.

Low – based on 25,000 license plates and 3% per year increase.
Medium – based on 37,500 license plates and 4% per year increase.
High – based on 50,000 license plates and 5% per year increase.

The Salton Sea Restoration would receive approximately $18 per license plate; this value is consistent with the other environmental license plates.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

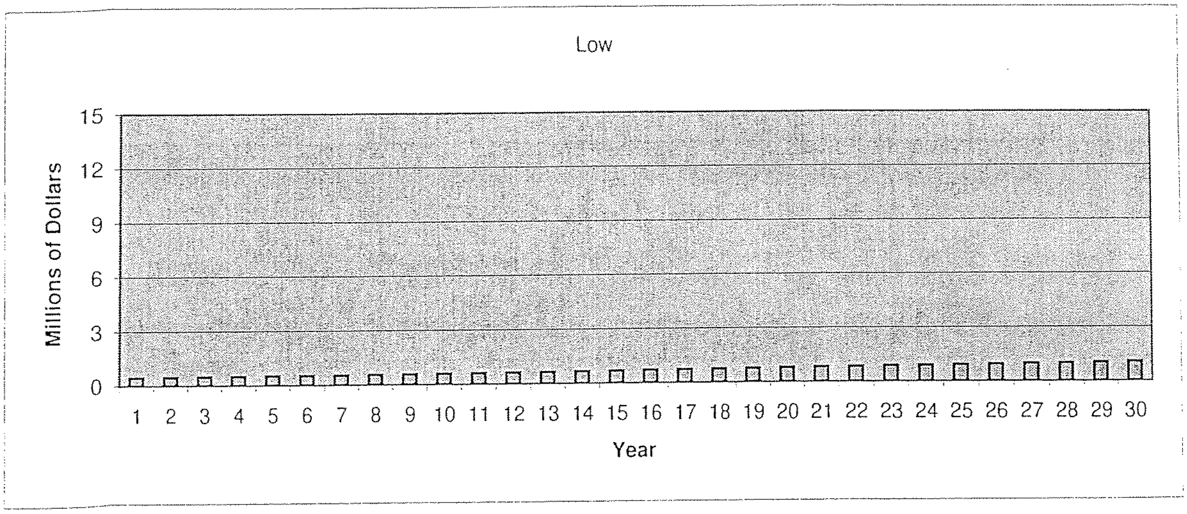
Table A (in millions of dollars)

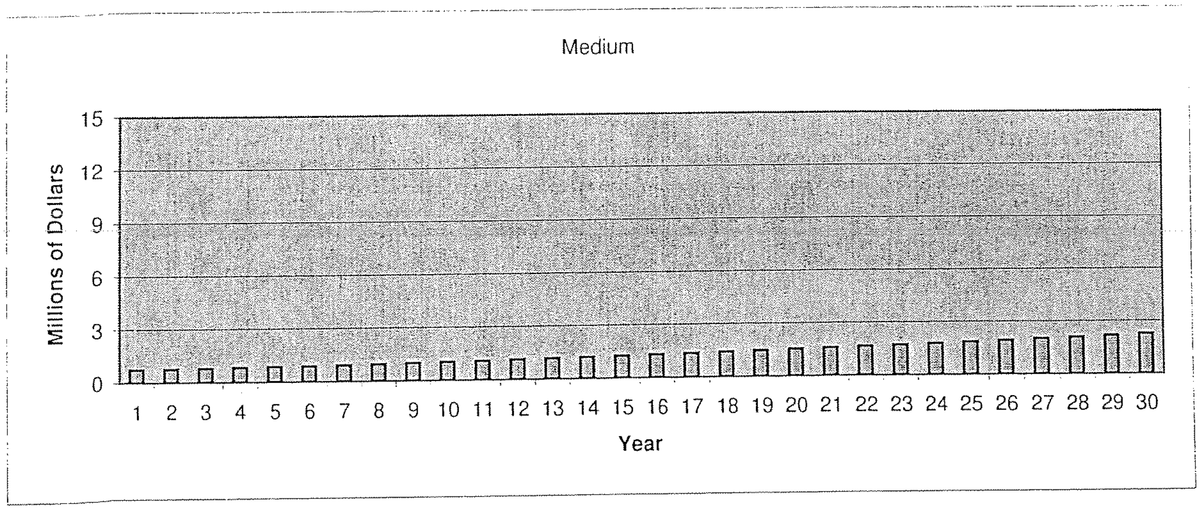
Year	Low	Medium	High
5	0.5	0.8	1.1
10	0.6	1.0	1.4
15	0.7	1.3	1.8
20	0.8	1.5	2.3
25	0.9	1.9	2.9
30	1.1	2.3	3.7

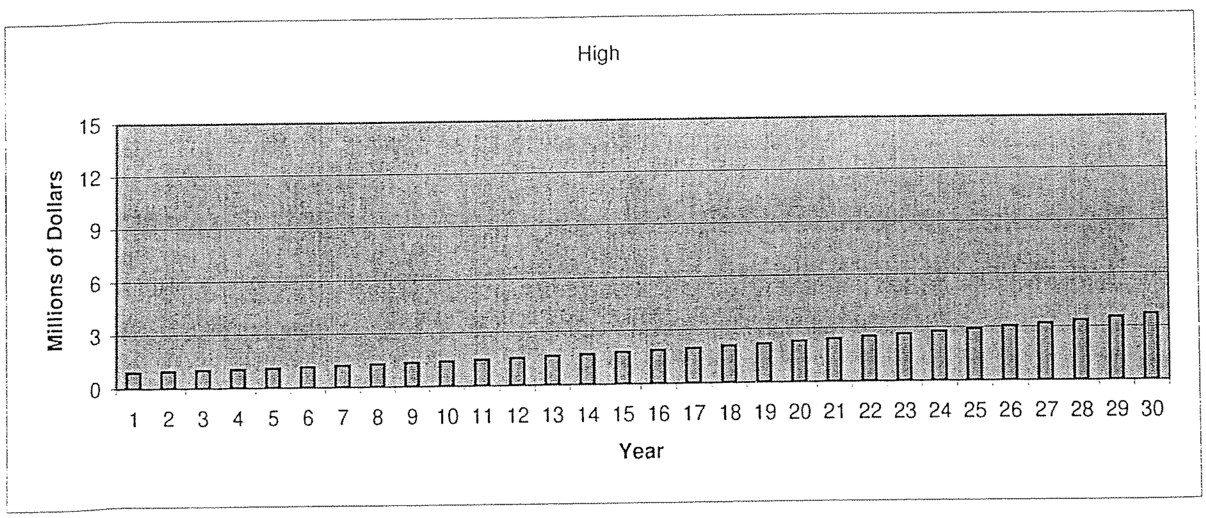
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	9	17	24

Annual Cash Flows from License Plates







A. Reasonably Likely Revenue Sources

3. Revenues from Boat Permits and Launch Fees

This revenue projection is based on projected revenues from launch fees. It is particularly noteworthy that these revenues are projected to increase by 3% per year after project completion in year 15. This seems a very conservative assumption in light of the popularity of other inland California water sports areas.

Year 1 Inception of Fees
Year 15 Year in which restoration project is substantially implemented.

Low – assumes fees increase by a factor of 5 by year 15 and 3% in subsequent years.
Medium – assumes fees increase by a factor of 10 by year 15 and 3% in subsequent years.
High – assumes fees increase by a factor of 15 by year 15 and 3% in subsequent years.

Year 1 Revenues assume 15,000 registered boats and 150,000 boat launches. Annual boat fees are assumed to equal $30 per boat and launch fees are assumed to equal $10 per launch. The fees are expected to grow as noted above under high, low, and medium scenario. The medium estimates in year 15 are equivalent to the Sea reaching twice as many visitors as Lake Perris currently has.

Special legislation would probably be required to dedicate an annual boat fee and the launch fees to Sea clean-up. It is probably more likely that only a portion of these fees would go to Sea clean-up, especially because increased recreational use of the sea would necessitate additional park staffing and increased maintenance expense.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

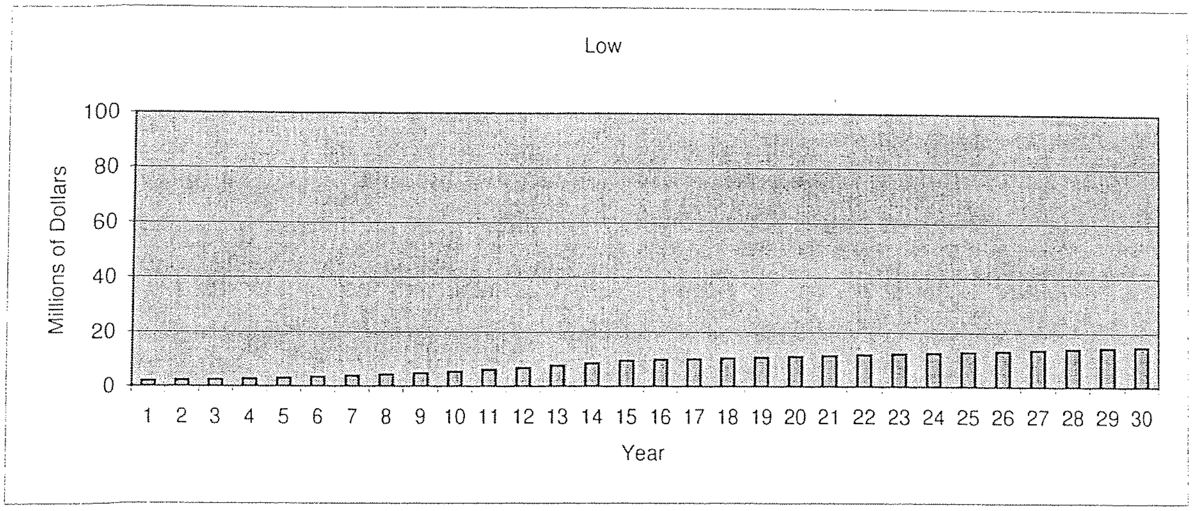
Table A (in millions of dollars)

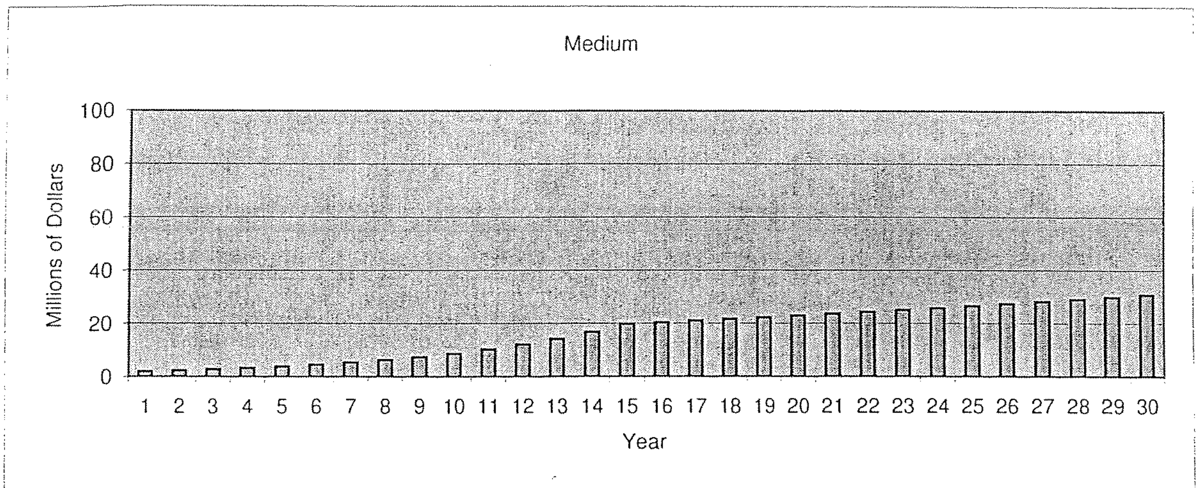
Year	Low	Medium	High
5	3.1	3.8	4.2
10	5.4	8.6	10.8
15	9.5	19.8	28.1
20	11.0	22.9	32.6
25	12.8	26.6	37.8
30	14.8	30.8	43.8

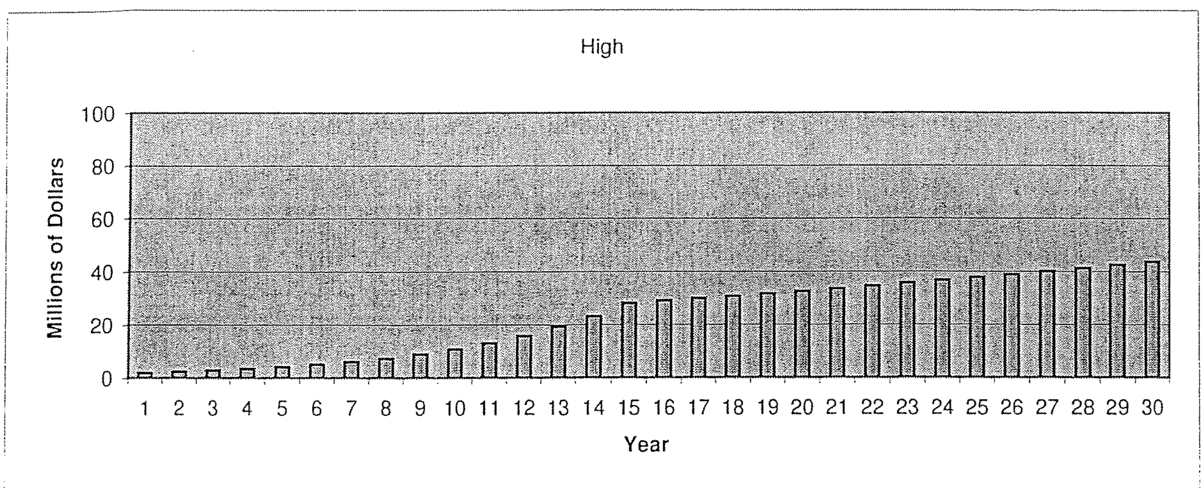
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	97	178	243

Annual Cash Flows from Boat Permits and Fees







A. Reasonably Likely Revenue Sources

4. Revenues from Salton Sea Fishing Stamps

Revenues from fishing license fees for Salton Sea fishing stamp.

Year 1 Inception of Fees
Year 15 Year in which restoration project is substantially implemented.

Low – assumes fees increase by a factor of 5 by year 15 and 3% in subsequent years.
Medium - assumes fees increase by a factor of 10 by year 15 and 3% in subsequent years.
High - assumes fees increase by a factor of 15 by year 15 and 3% in subsequent years.

Numbers for 1997 indicate about 250,000 visitor days for fishing purposes for the Imperial Wildlife Area and the Salton Sea State Recreation Area. If it is assumed that the average visitor makes 2.5 visits, then this is a total of 100,000 different anglers. If an annual Salton Sea Stamp costs $3 and 100,000 stamps are purchased each year then $300,000 in revenues could be raised in the first year. As the sea is restored and concerns about the safety of consuming the fish from the sea are reduced, then we would expect a significant increase in the number of annual anglers.

Allocating revenues from such a fee would probably require special legislation. Again, it is unlikely that all increased revenue would be dedicated to Sea clean-up.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

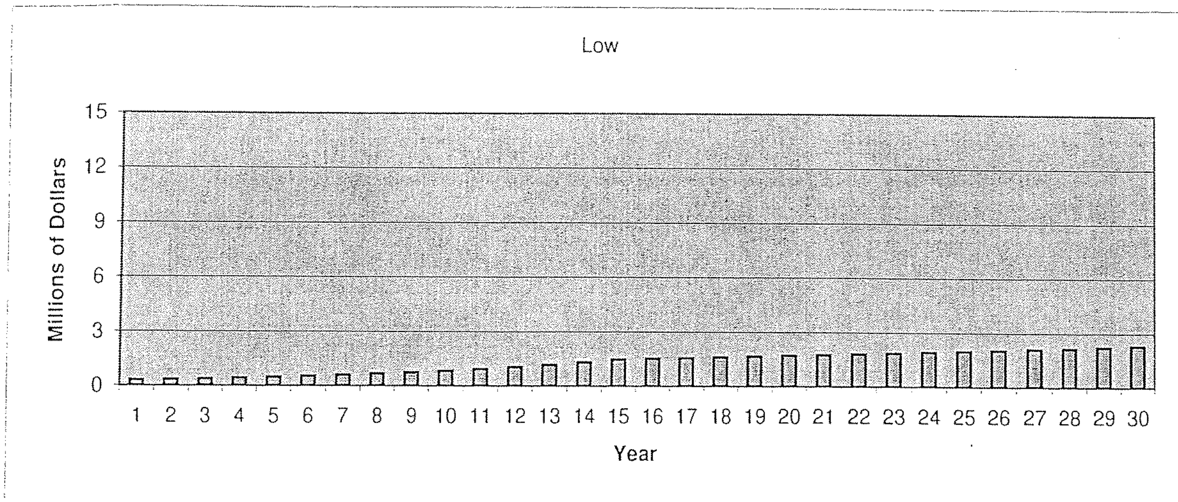
Table A (in millions of dollars)

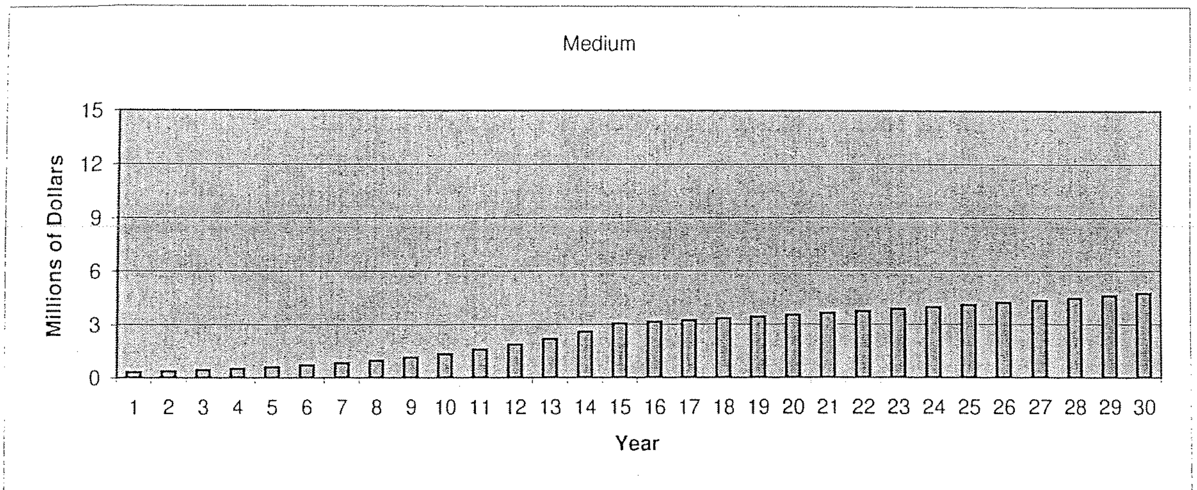
Year	Low	Medium	High
5	0.5	0.6	0.6
10	0.8	1.3	1.7
15	1.5	3.0	4.3
20	1.7	3.5	5.0
25	2.0	4.1	5.8
30	2.3	4.7	6.7

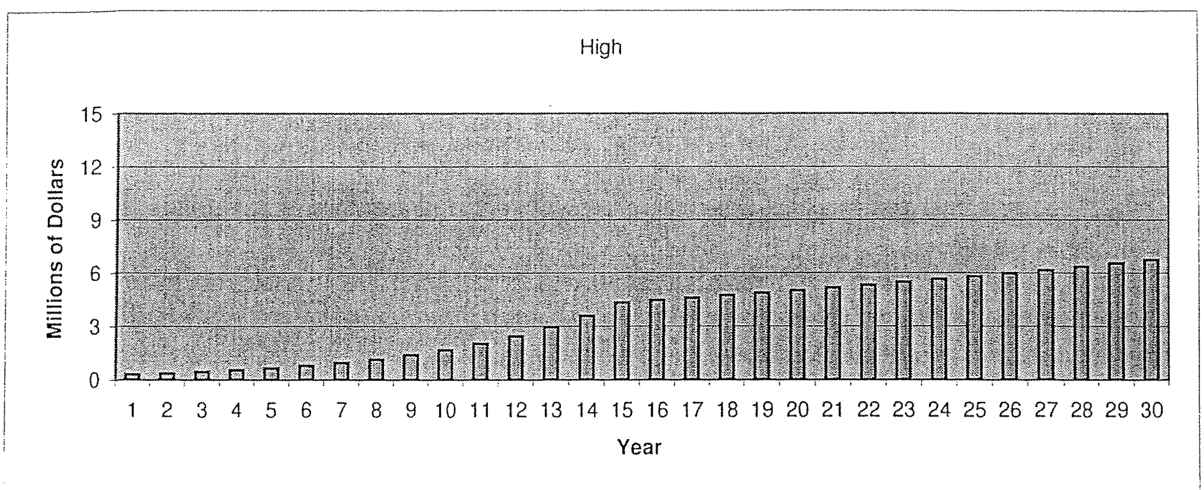
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	15	27	37

Annual Cash Flows from Fishing Stamps







B. Possible Revenue Sources

1. Revenues from 0.5% Sales Tax Increase in Salton Sea Focus Area

Revenues from 0.5% sales tax in Salton Sea Focus Area that is defined as census tracts 101, 102, 123, 124, 456.01, 456.02, 457.01, 457.02.

Year 1 Inception of Fees
Year 15 Year in which restoration project is substantially implemented.

Low – assumes fees increase by a factor of 5 by year 15 and 3% in subsequent years.
Medium - assumes fees increase by a factor of 10 by year 15 and 3% in subsequent years.
High - assumes fees increase by a factor of 15 by year 15 and 3% in subsequent years.

The initial estimates of $400,000 per year in tax revenue are based on the 1993 reported sales tax revenues in the focus area of $75.5 million. A 0.5% increase in the sales tax only instituted in the focus area would initially generate this revenue and it is expected to grow as described above, according to Professor Bazdarich's projections.

To establish a special sales tax increase in the focus area would probably require a popular vote and special legislation. If, on the other hand, a general sales tax increase was imposed county wide, in each county then the proceeds of such a sales tax would most likely go to the county's general fund. It would the prerogative of the Board of Supervisors of each county as to how these funds would be spent.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

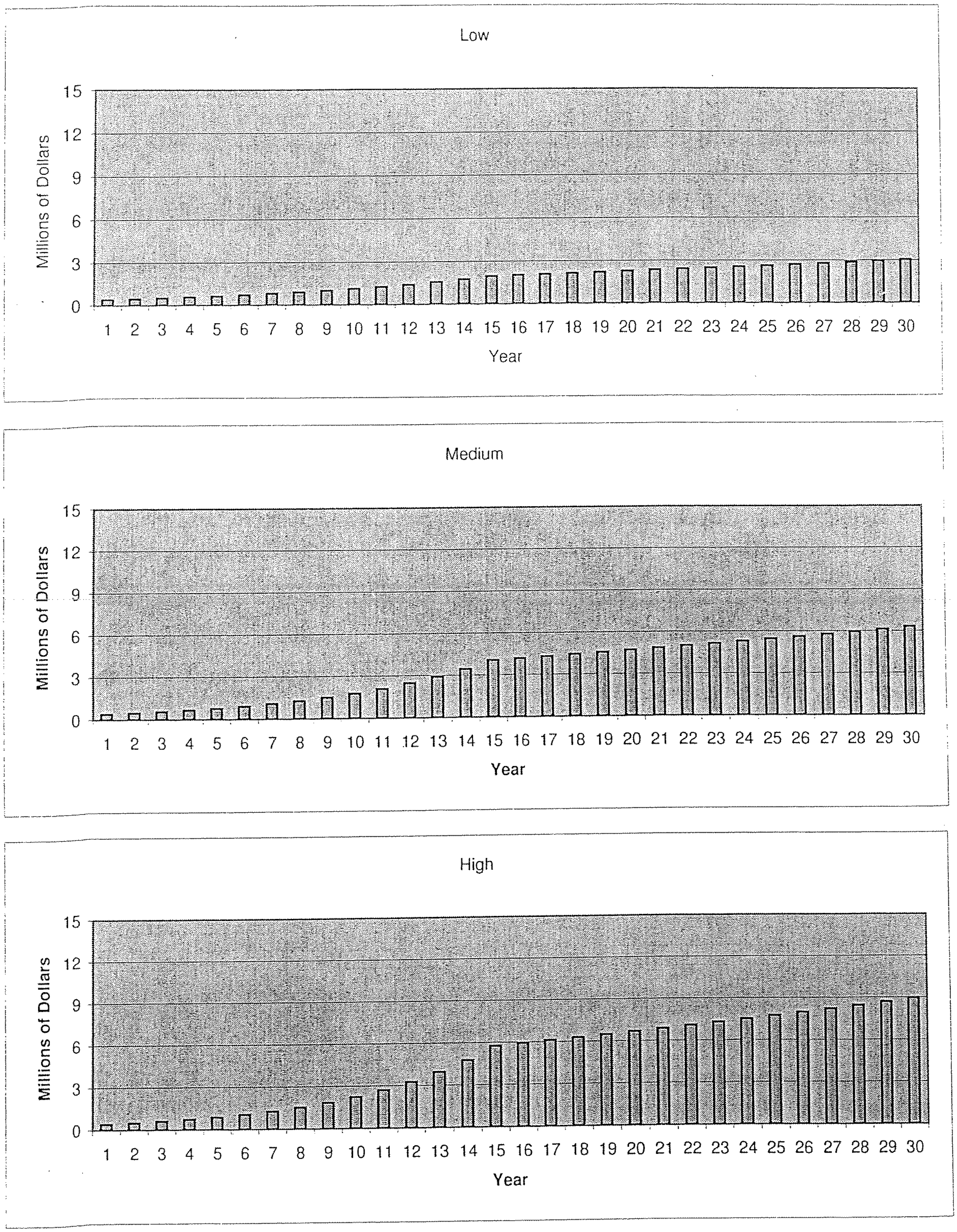
Table A (in millions of dollars)

Year	Low	Medium	High
5	0.6	0.8	0.9
10	1.1	1.8	2.2
15	2.0	4.1	5.8
20	2.3	4.7	6.7
25	2.6	5.5	7.8
30	3.0	6.3	9.0

Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	20	37	50

Annual Cash Flows from 0.5% Sales Tax Revenue Increase in SSFA



B. Possible Revenue Sources

2. Revenues from Transient Occupancy Tax within Salton Sea Focus Area

Revenues from a 10% transient occupancy tax with ½ of the tax revenue going to the restoration of the Salton Sea.

Year 1 Inception of Fees
Year 15 Year in which restoration project is substantially implemented.

Low – assumes revenues increase to $1.5 million by year 15 and grows by 3% in subsequent years.
Medium – assumes revenues increase to $2.25 million by year 15 and grows by 3% in subsequent years.
High – assumes revenues increase to $3 million by year 15 and grows by 3% in subsequent years.

The initial values of $0.5 million come from 10% tax on $5 million in total transient occupancy revenue that is approximately the current level of unincorporated areas of Riverside and Imperial County. The eventual high value is consistent with similar revenues currently raised in Palm Desert. Again, the Board of Supervisors in each county would make any decision about imposition of TOT's and allocation of the proceeds.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

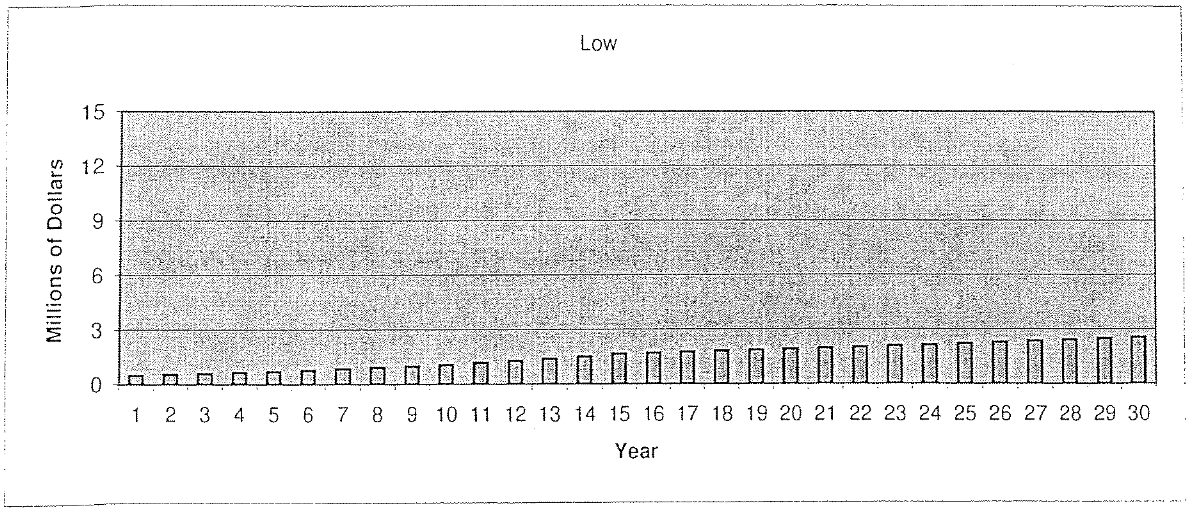
Table A (in millions of dollars)

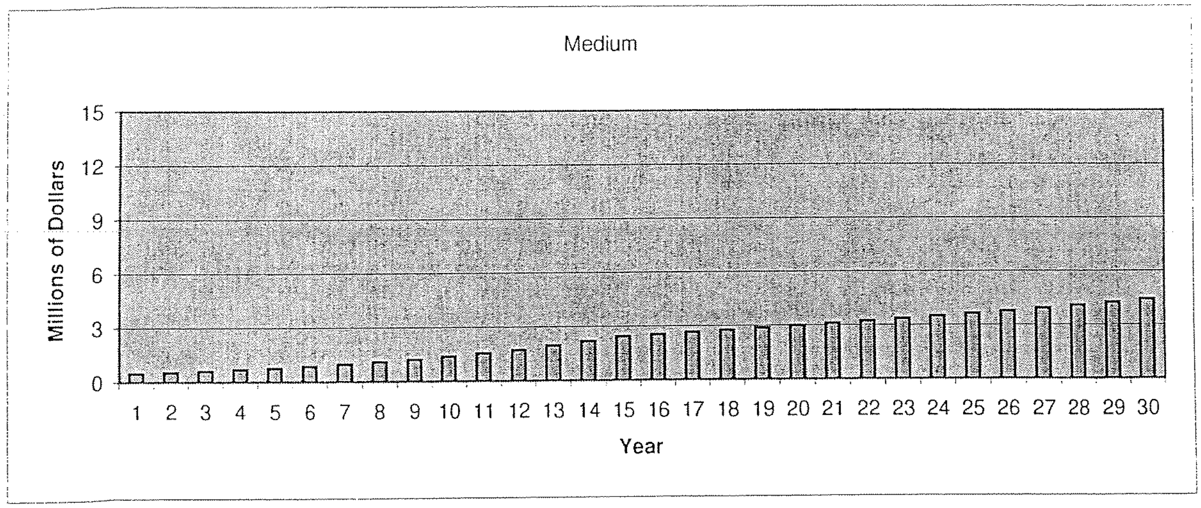
Year	Low	Medium	High
5	0.7	0.8	0.8
10	1.1	1.4	1.6
15	1.6	2.5	3.1
20	1.9	3.0	3.9
25	2.2	3.6	5.0
30	2.6	4.4	6.4

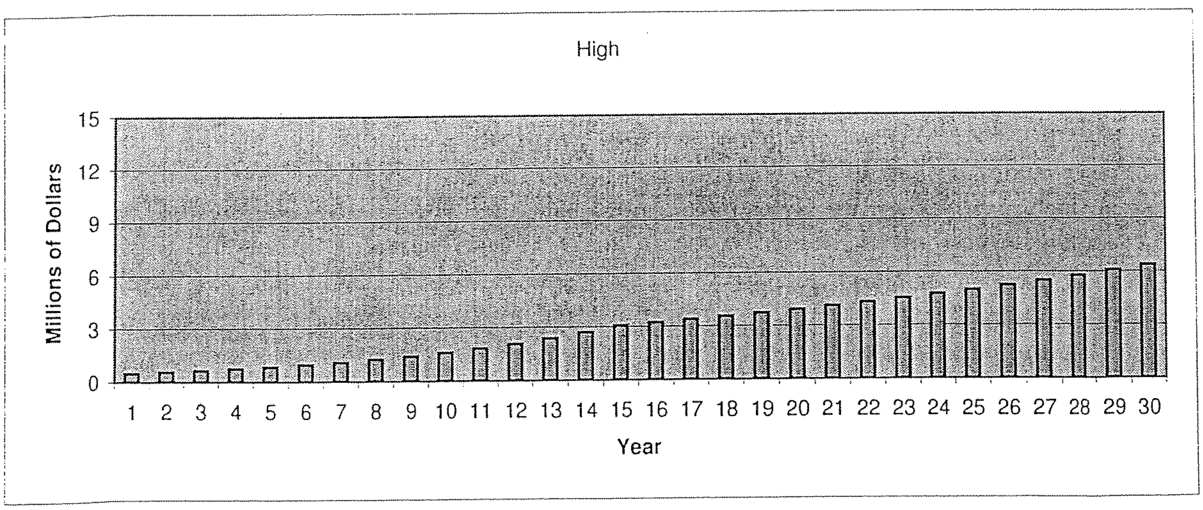
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	18	26	33

Annual Cash Flows from Transient Occupancy Tax Revenues







C. Problematic Revenue Sources

1. Revenues from Geothermal Energy Production

There is the potential revenue from royalties from the operation of a geothermal plant or geothermal plants around the Salton Sea. The legal and technical factors involved preclude a reasonable estimate of these revenues at this stage.

C. Problematic Revenue Sources

2. Revenues from Casino

This revenue is based on the expectation of a casino being built at the north end of the Salton Sea. Proposition 5 provides a 6% set aside from casino gross win.

Year 1	Inception of Revenue	$40,000,000 gross win
Year 2	Revenue doubles	$80,000,000 gross win
Year 3	Revenue increase by additional 25%	$100,000,000 gross win

Low – assumes revenues are 1% of gross win and increase by 3% per year in subsequent years.
Medium – assumes revenues are 3% of gross win and increase by 4% per year in subsequent years.
High – assumes revenues are 3.5% of gross win and increase by 5% per year in subsequent years.

These revenue projections were made by a local casino operator. If these projections are correct, then the revenue steams will be as projected above.

Table A and the graphs show the estimated future cash flows generated (in millions of dollars). Table B shows the net present value of these cash flows (in millions of dollars). Net present value is how much someone (i.e. a bond underwriter) would be willing to pay today for the cash flows generated in the future.

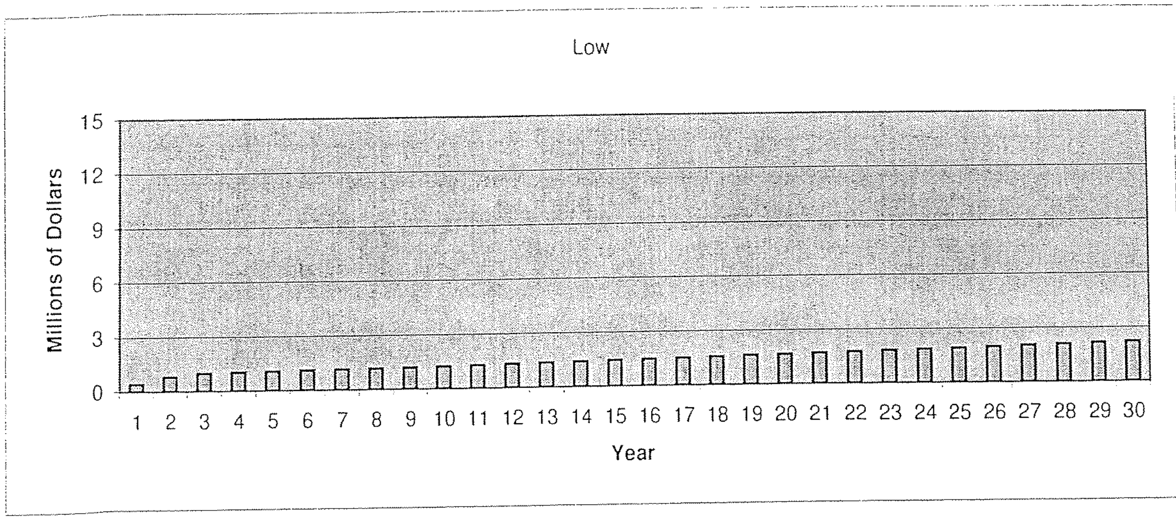
Table A (in millions of dollars)

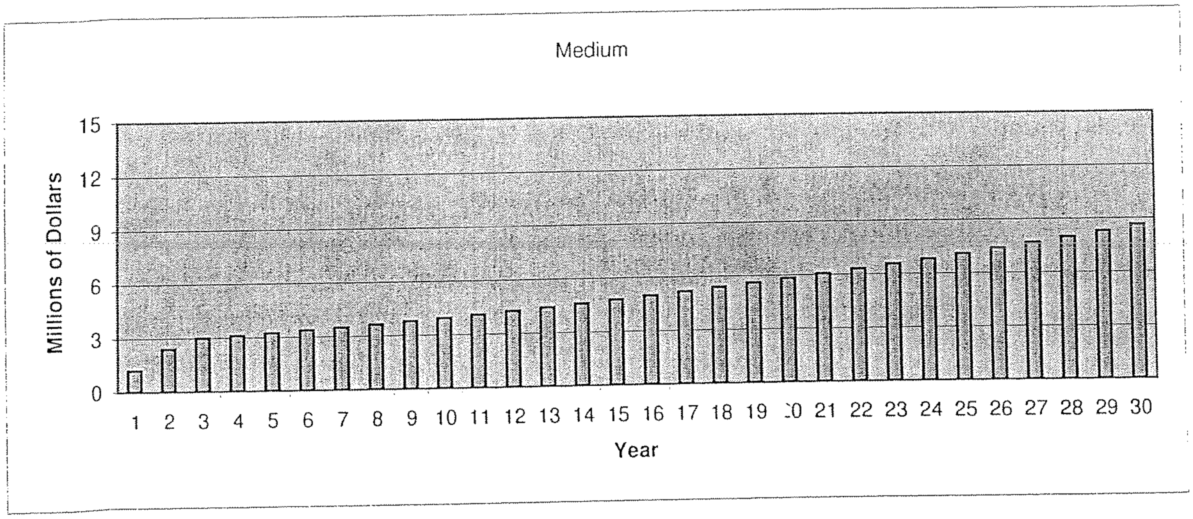
Year	Low	Medium	High
5	1.1	3.2	3.9
10	1.2	3.9	4.9
15	1.4	4.8	6.3
20	1.7	5.8	8.0
25	1.9	7.1	10.2
30	2.2	8.7	13.1

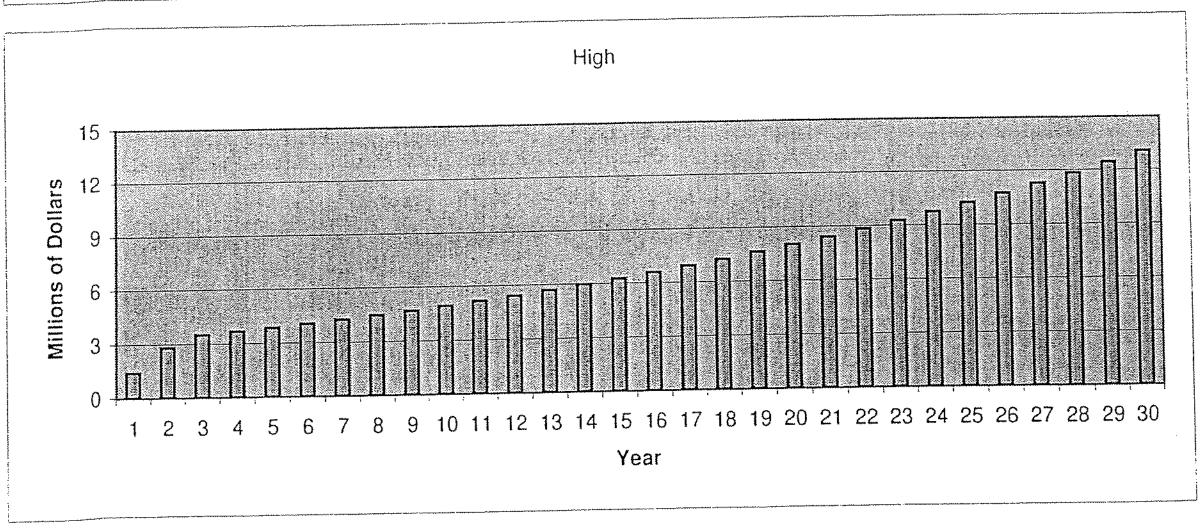
Table B (in millions of dollars)

	Low	Medium	High
Net Present Value	37	63	82

Annual Cash Flows from Casino







C. Problematic Revenue Sources

3. Revenues from Water Transfers, Conservation, and Recycling

While there may be considerable potential revenues from water transfers, conservation, and recycling, the legal, technical and economic factors involved preclude any reasonable estimate of the magnitude of these revenues being accurately forecast at this stage. A preliminary review of the potential revenues from these sources indicates the potential for fairly substantial sums to be generated, but additional information will be required before a useful estimate of revenues can be made.

C. Problematic Revenue Sources

4. Redevelopment

Redevelopment Agencies (RDAs) have been established throughout California. The original intent of the state legislature in sanctioning the establishment of RDAs was to allow local governments a means to alleviate blight, build low cost housing, provide infrastructure, and stimulate economic development in depressed areas. Local governments could declare an area blighted, establish an RDA, condemn and assemble parcels for various private and public sector projects, and most importantly, cap the property tax revenue going to other governments, thereby allowing the RDA to garner the increased property tax revenue generated within its boundaries (the "increment") to finance its activities.

By the mid-1980s concern was being expressed about the amount of tax money RDAs were diverting from other local governments. Also, concern was mounting that some cities were using very broad definitions of blight to establish RDAs in what were non-urban and non-blighted areas. In response to these concerns, the state legislature passed AB 1290 effective January 1994. AB 1290 basically decreased the relative amount of tax revenues that RDAs could retain, and curbed the practice of establishing RDAs in non-urban areas.

Applicability to the Salton Sea clean-up efforts

In order to establish a Redevelopment Area around the Salton Sea, a number of very challenging obstacles would have to be overcome. First, special legislation would probably be required to allow such an RDA to be established. Establishing an RDA under current law appears to be difficult, at best. Second, the Boards of Supervisors in both Imperial County and Riverside County would have to approve the establishment such an RDA. Third, opposition from existing governmental entities that receive property tax revenue from the new RDA's area might be substantial.

C. Problematic Revenue Sources

5. Property Tax Revenue

Bazdarich (1998) estimates that the successful restoration of the Sea will result in property value increases of $2,165 million for the area located within one-half mile of the Salton Sea shoreline. Under the assumption of 3.5% interest rate, a 1.0% taxation rate, he estimates that the present value of increases in property tax revenues that accompany the increased property values to be $458 million. With similar assumptions about property turnover rates and taxation rates but with the more conservative estimate for the interest rate of 5.5% that we use throughout our analysis, the present value of this payment stream is $254 million. It is important to note that these estimates provide the present value of the property value increase as a result of cleaning up the Sea. The longer the time to complete restoration, the lower the present value of this revenue stream due to the longer delay in receiving these revenues. These estimates will also be lower (higher) if the property turnover rate is lower (higher).

Under current, law these property tax revenue increases would continue to be apportioned to the various local government entities (counties, cities, special districts and school districts as applicable) in the same manner and proportion as is currently the case. Any attempt ot garner part of this increased property tax revenue stream would most likely face substantial opposition from the current recipients.

Section IV:
Potential Government Structures

IV. Potential Government Structure

Typically, government structures in complex situations such as this one involve all three levels of government, federal, state, and local.

In this instance, the federal government will be involved for a number of reasons. First, the Bureau of Reclamation is involved with any substantial matters concerning the Colorado River, water usage from the river, and the Salton Sea itself. Second, because another sovereign government, Mexico, impacts and is impacted by what happens in the Salton Sea Basin, the federal government is going to be involved. Third, it is likely that any substantial reclamation of the Salton Sea is going to require federal financial support. Fourth, the complex environmental issues surrounding the Salton Sea will almost inevitably involve federal agencies. Fifth, the interest of the California congressional delegation will perforce cause federal involvement.

The State government will be involved for a number of reasons as well. First, the Salton Sea is in the State and hence subject to state laws and regulations, notably environmental laws, but also others. Second, there is a state park on the shore of the Salton Sea. Third, most fiscal matters surrounding any Salton Sea environmental mitigation will involve state financing, and perhaps more importantly, state legislative sanction. Fourth, the unique nature of the Salton Sea (it is located in two counties) virtually guarantees that specific state legislation will be necessary to implement any comprehensive improvement program.

Local governments are involved for the very reason that the Salton Sea is located in both Imperial and Riverside Counties and because the IID and CVUD are intimately involved with the water sources for the Sea.

In sum, the Salton Sea is a unique hydrological feature that affects and is affected by all three levels of government. This suggests that some sort of broad joint powers authority with representation from each of the levels of government is appropriate to have cognizance over any major, comprehensive approach to improving the Salton Sea.

There are a number of structural governance models that could be employed (For example, a nine member board, three approved by the feds, three by the state, two from the water districts and one from a local Indian Tribe). In any event, concurrence of all three levels of government is probably necessary, and the number and composition of the board would have to be palatable to all parties concerned.

Because the counties and the water districts are legal entities of the state, the state and federal governments will probably be the dominant players in structuring the joint powers authority. Similarly, because almost any local revenue raising options will require state enabling legislation, the state will, again, be the dominant player.

The Everglades presents a similar situation in that it is a complex water related resource, with many interested parties. In this particular case, a Task Force was created at the

Federal level, which led, in turn, to the formation of a more local working group. This model gives some idea of the number of federal, state, and local entities involved in a project of this magnitude.

Florida Everglades Task Force:
7 federal members
2 Indian tribes
2 representatives of the state
South Florida Water Management District
2 representatives of local governments in south Florida
Secretary of the Army

Florida Everglades Working Group:
14 local federal members
2 Indian tribes
5 state agencies
Florida Governor's Office
South Florida Water Management District
2 representatives of local governments in south Florida
Secretary of the Army

The CALFED Bay-Delta Program, with management and regulatory responsibility in the Bay Delta Estuary, is another example of state-federal cooperation. CALFED is comprised of the following agencies:

Federal:
1. Department of the Interior
2. Bureau of Reclamation
3. Fish and Wildlife Service
4. Environmental Protection Agency (EPA)
5. Department of Commerce
6. National Marine Fisheries Service (NMFS)
7. U.S. Army Corps of Engineers (COE)
8. Department of Agriculture
9. National Resource Conservation Service

State:
1. Resources Agency
2. Department of Water Resources (DWR)
3. Department of Fish and Game (DFG)
4. California Environmental Protection Agency
5. State Water Resources Control Board

Section V:
Consequences of Allowing Further Deterioration

V. Consequences of Allowing Further Deterioration of the Salton Sea

If the Salton Sea continues to deteriorate, then there are 3 broad costs:

1. Decreased Property Values - The Salton Sea Authority (1995) reports that there were 15,405 total housing units with an average value of $92,600 in the Salton Sea Focus Area. This is a total housing stock value of $1.4 billion. If the *relative decrease* in the value of this housing stock is 5% per year for 20 years, then value of the housing stock will be $900 million less than it would have otherwise been. This decrease has a present value of $585 million at an interest rate of 5.5%. It is important to understand what a *relative decrease* in property values represent. If property values would have increased by 3% in the absence of the deterioration of the Sea and instead decrease by 2% per year, then this is a *relative decrease* of 5%. If the *relative decrease* in the value of this housing stock is 10% per year for 20 years, then value of the housing stock will be $1.2 billion less than it would have otherwise been. This decrease has a present value of $866 million at an interest rate of 5.5%. If non-residential property in the focus area has a value of 25% to 50% of the value if the residential property, then we have further decreases of $146.25 million to $433 million. As the problems associated with further degradation spill over to areas outside the focus area, these costs will increase. In addition decreased property values will lead to decreases in property tax revenues.

Expected Value of Loss – $731 million to $1,299 million.

2. Decreased Economic Activity - The Salton Sea Authority (1995) provides updated values of a 1989 study (CIC Research Inc.) of economic activity that results from recreational visits to the Salton Sea. These estimates indicate 2.6 million visitor days to the Sea and a total Economic Impact of $385 million. If we assume a similar current economic impact and that further deterioration results in relative decreases in economic activity of 5%, then this will result in a decrease in relative economic activity of $247 million within 20 years. The present value of this decrease at an interest rate of 5.5% is $161 million. If further deterioration results in relative decreases in economic activity of 10%, then this will result in a decrease in relative economic activity of $338 million within 20 years. The present value of this decrease at an interest rate of 5.5% is $238 million.

Expected Value of Loss – $161 million to $238 million.

3. Environmental degradation, loss of habitat and bio-diversity, decreases in the quality of life - The largest cost of further degradation of the Salton Sea is likely to be in terms of environmental damage. Continued degradation is likely to result in increased fish die-offs and subsequent waterfowl die-offs. While the decreased economic activity captures some of these effects, the potential loss of species and decreased bio-diversity is likely to have much larger costs. The resulting unpleasantness that such die-offs cause for human

beings in the area is also difficult to value. Decreases in property values can only capture a portion of these losses. In the longer term as the Sea recedes, the increased cost of the resulting dust, which is likely to contain toxic particles, will lead to even greater decreases in the quality of life for the surrounding communities. Based on current efforts to reduce dust levels in Owens Valley, Quinlan (1998) estimates expenditures of \$90 million to \$132 million per year will be needed to reduce dust levels at the Salton Sea. If this dust abatement program begins in ten years, then at a present value of 5.5% per year the present value of these costs are \$0.9 billion to \$1.4 billion. At this point we are unable to place a dollar value on these costs other than to suggest that they are likely to be at least as large as the economic costs.

Section VI:
Overall Economic Benefits of Salton Sea Restoration

VI. Overall Economic Benefits of Salton Sea Restoration

Bazdarich (1998) estimates an annual average flow of benefits equal to $160 million from the restoration of the Salton Sea as a result of increased economic activity and increased property values within ½ miles of the Salton Sea. At an interest rate of 5.5% these benefits in perpetuity have a present value of $2.9 billion. These estimates do not include the benefits that will accrue to areas outside this ½ mile area. Under the assumption that the benefits accruing outside the area are equal to 50% of the benefits in the ½ mile area, then we have an increase in the annual benefits of $80 million per year with a present value of $1.45 billion. If the benefits accruing outside the area are equivalent to the benefits in the ½ mile area, then we have an increase in the annual benefits of $160 million per year with a present value of $2.9 billion. It should be noted that some of these benefits will of necessity be allocated to the improvement of the Sea.

Total estimates $4.35 billion to $5.8 billion.

Federal level, which led, in turn, to the formation of a more local working group. This model gives some idea of the number of federal, state, and local entities involved in a project of this magnitude.

Florida Everglades Task Force:
7 federal members
2 Indian tribes
2 representatives of the state
South Florida Water Management District
2 representatives of local governments in south Florida
Secretary of the Army

Florida Everglades Working Group:
14 federal members
2 Indian tribes
5 state agencies
Florida Governor's Office
South Florida Water Management District
2 representatives of local governments in south Florida
Secretary of the Army

The CALFED Bay-Delta Program, with management and regulatory responsibility in the Bay Delta Estuary, is another example of state-federal cooperation. CALFED is comprised of the following agencies:

Federal:
1. Department of the Interior
2. Bureau of Reclamation
3. Fish and Wildlife Service
4. Environmental Protection Agency (EPA)
5. Department of Commerce
6. National Marine Fisheries Service (NMFS)
7. U.S. Army Corps of Engineers (COE)
8. Department of Agriculture
9. National Resource Conservation Service

State:
1. Resources Agency
2. Department of Water Resources (DWR)
3. Department of Fish and Game (DFG)
4. California Environmental Protection Agency
5. State Water Resources Control Board